JPRS 81868

28 September 1982

East Europe Report

SCIENTIFIC AFFAIRS

No. 755

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 81868

28 September 1982

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 755

CONTENTS

BULGARIA

Research Activities, Achievements in Molecular Biology
(VECHERNI NOVINI, 14 Aug 82) 1

CZECHOSLOVAKIA

SM 52/11 Computer System, SMEP II Program Described
(Vladimir Hanus; VYBER INFORMACE Z ORGANIZACNI A VYPOCETNI TECHNIKY, No 2, 1982) 4

Synthetic Pheromones Program Outlined
(Rudolf Bezak; CHEMICAL REVIEW, Apr 82) 14

Research, Development of Plant Protection Preparations
(Stefan Varkonda; CHEMICAL REVIEW, Apr 82) 17

Pesticide Application Trends
(Frantisek Richter and Vaclav Peterka; CHEMICAL REVIEW, Apr 82) 22

Weed Control in Forestry
(Olga Valkova; CHEMICAL REVIEW, Apr 82) 28

Use of Pesticides in Forestry
(Miroslav Srot; CHEMICAL REVIEW, Apr 82) 37

Production, Quality Improvement of Chemical Fertilizers
(Jan Palka, et. al.; CHEMICAL REVIEW, Apr 82) 44

Perspective of Liquid Fertilizers
(Miroslav Kalina; CHEMICAL REVIEW, Apr 82) 55

Hungary

Research, Production of Blood Preparations
(MAGYAR TUDOMANY, Jun 82) 60

Self-Sustaining Fund Approved for Computer Technology Applications
(Katalin Szikora; MAGYAR HIRLAP, 28 Jul 82) 64

RESEARCH ACTIVITIES, ACHIEVEMENTS IN MOLECULAR BIOLOGY

Sofia VECHERNI NOVINI in Bulgarian 14 Aug 82 p 4

> [Text] Molecular biology and molecular genetics occupy leading places in the development of world science. This fact is determined by two main causes. The first is that these sciences reveal the most profound nature of living matter. The second cause is that they create the foundation of modern biotechnology. This is an especially promising branch of industry which, many experts believe, will fundamentally change modern economy.

These were the words with which we began our conversation with the professor and Doctor of Biological Sciences, Asen A. Khadzhiolov. This general statement is only a transition to the topic which was the reason for our meeting. Bulgarian biological science is not alien to the world problems and great achievements which characterize the revolutionary advance of modern biology. The center of these developments in our country is the Institute for Molecular Biology at the BAN [Bulgarian Academy of Sciences]. I asked Professor Khadzhiolov, deputy director of the institute, to outline the main problems which are being explored, since they constitute the basis of the Bulgarian participation in molecular biology and molecular genetics.

"Molecular biology is a leader among the modern natural sciences. As we all know, this was explicitly mentioned in the resolutions of the 12th BCP Congress. The great role and responsiblity of the Institute for Molecular Biology ensue from these resolutions.

"Of course, our institute cannot work on all problems. The goal is to focus our efforts on key problems and themes which we should study at the level of modern science. The organization, structure and functions of the chromatin, which is related to heredity in higher organisms, is being studied. We are working on the problem of the structure of deoxyribonucleic acid (DNA). In higher organisms it is built in a special way, still unclear to science. The genes, which are built by DNA, are linked with great areas of DNA whose structure is still unknown. The discovery of this structure will be of considerable importance for knowledge of the hereditary mechanism. Another problem which is being intensively developed is the mechanism of work of the separate genes in the cell, and especially the mechanism of ribosome forming.

They are immediately engaged in the work of all genes in the cell. In connection with this problem, we pay special attention to the possibility of isolating individual genes (from higher animals and humans) and their transfer into bacterial cells where they could produce the respective protein. We have implemented the basic methods and now we can isolate individual genes and transfer them into bacterial cells.

"On the basis of these theoretical studies, our institute is working on a directed synthesis of analogs of amino acids and nucleic acids, which have a healing effect in certain diseases."

Fundamental research work gives contributions with important theoretical significance. Please, mention some such achievements of the institute.

"I will limit myself to some scientific achievements more comprehensible to the layman and will try to present them in a simpler form. Important results on the structure of chromatin were achieved by the team led by Academician Rumen Tsanev. Some basic properties of the nucleosome organization of the chromatin and the process of the very building of nucleosomes were discovered, as well as the importance of individual histone and nonhistone proteins in the replication of chromatin. The research reveals the mechanism of cell division. And these mechanisms are related to such important processes as the normal and the pathological growth of the cells, which can be observed, for example, in tumor tissues.

"Other, even more interesting, scientific achievements are related to the development of methods for transformation of microorganisms, i.e., transport of genes into microorganisms. This has been achieved with the genes for enteroxins of the intestinal bacterium and the genes for ribosome ribonucleic acids of higher organisms.

"Considerable results were achieved in the research of the structure and expression of the genes. An original method was developed which makes it possible to single out only those genes, from the great number of genes in the cell, which are functional in a given moment of our life, i.e., the active genes. We expect that through this method we will discover possibilities for control of the switching on and off of the genes in different normal and pathological processes.

"The research of the action mechanism of the analogues of nucleic acids, which we have synthesized, revealed considerable regularities which gives the possibility for intervention in the metabolism of the cells.

"Another large area of application of the scientific achievements is their practical usage. In this way, they are realized as factors with immediate importance for the advance of separate branches and, in the final score, they are a contribution to the total development of the economy in our country.

"We have reasons to believe that modern biotechnology in our country will develop even faster in the coming future. That is why our applied projects are aimed at solving problems mainly in this area. Based on methods of genetic engineering, original approaches are being developed in our institute for the creation of some biologically active substances. One of them is the interferon, which has a strong curative effect in virus infections. We are also developing technologies for the use of mutation enzymes produced by us as nutritional protein. Some compounds synthesized in the institute showed strong antitumor effects and are currently in the process of experimental and clinical testing.

"With its theoretical and applied studies, the Institute for molecular biology makes and will continue to make its contribution for the implementation of the biologization as a main factor in the development of the country's economy."

9804
CSO: 2202/18

SM 52/11 COMPUTER SYSTEM, SMEP II PROGRAM DESCRIBED

Prague VYBER INFORMACE Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 2, 82 pp 159-166

[Article by Vladimir Hanus: "Systems of SMEP Series II"]

[Text] The low cost, cheapness of operation and power of the highly competitive series of medium-sized computers and their wide, easy adaptability to specific requirements, which brings computers closer to the use, are the main advantages of mini- and microcomputers. The benefits of incorporating them result to a considerable degree from their software. The operating systems of mini- and microcomputers are much simpler than large operating systems, are primarily interactive, and guide the user to correct formulation of his requirements. The use of a large number of display terminals allows operation in the dialog mode and makes it possible to limit hard copy to essential needs, in addition to bringing about direct contact between the user and the computer. Most of the service work is conducted by the operating system. Compatibility with systems higher in the hierarchy in both on-line and off-line operation results from the choice of a transmission channel or a suitable medium, while inefficient intermediate steps (e.g., the old-fashioned punching [on tape or cards] of raw data or data conversion) can be entirely eliminated. This list of advantages applies to products developed under the SMEP II program here in Czechoslovakia. In comparison with the systems delivered under the designation SMEP I, the new systems make more use of the advantages offered by microcomputers, in addition to which the minicomputers which previously were the nucleus of the SMEP system have been substantially modernized.

The production program for SMEP series II, whose products will meet user demand this year and in succeeding years, currently consists of four basic types:

System	Characteristics	Equivalent	Year
SM 52/11	Minicomputer with most powerful SMEP processor	PDP-11/60	1983
SM 50/40	8-bit microcomputer	Intel 8080A	1982
SM 50/50	16-bit microcomputer	LSI II, AM2901	1983
SM 53/10	Distributed multicomputer system based on SM 50/40 or 50/50		1984

In addition to these systems, a video graphics-processor with a memory-equipped display unit based on the Intel 3000, designated the SM 54/30, is in the production-preparation stage. The SMEP series I systems, which are now in extensive use, will be replaced in the future by series II. The production of the SM 3-20 is to be terminated in 1984 and that of the SM 4-20 in 1985-1986; their replacement, particularly in the ASR TP [Automated System of Technological process control] area, will be extremely simple and beneficial. In the ASRP [enterprise automated management system] field, when very simple applications such as simple data collection are not involved, the SM 52/11 is currently the most suitable replacement for the SMEP I series, and more attention should be devoted to it.

The SM 52/11 16-Bit Minicomputer

Designed for real-time, time-sharing operation, this system is upwardly design-, system- and program-compatible with the SM 3-20 and the SM 4-20. Its basic configuration consists of:

--the SM 1403 processor,

--a 128 KByte self-correcting NMOS semiconductor main store (64K-word module),

--a simple time clock,

--a disk-pack store controller,

--a double disk-pack store (2 x 2.5 MByte),

--a display,

--a matrix printer,

--a processor frame,

--a power-supply frame,

--a rack,

--a programmer's console.

The SM 1403 Processor

This processor consists of an ALU [Arithmetic and Logic Unit] and control unit with the SMEP instruction set, an internal expanded instruction set and instructions for floating-point arithmetic, the memory organizer and programmable stack allocation, cache memory, a programmer's console and circuitry for system functions such as instruction decoding, priority levels and interrupt, interface with the common bus, error control, and automatic restart after loss of power.

The ALU [microprogram type) allows the use of 132 instructions, including instructions for multiplication, division, 32-bit and 64-bit arithmetic, floating-point arithmetic and user-microprogrammed and service instructions. The main instruction set is intended for basic applications and is identical with that of the SM 3-20. The expanded instruction set, compatible with the

SM 4-20, controls fixed-point arithmetic operations and multiple shifts or cycles. The internal floating-point processor [FPP], compatible with the SM 4-20, operates sequentially in simple or double-precision arithmetic.

The memory organizer (identical with that in the SM 4-20) is responsible for memory protection and program relocatability and allows addressable memory to be expanded from 56 KByte to 248 KByte. The virtual address area has 16-bit addresses, while the physical area has 8-bit addresses. Programmable stack allocation allows operation with hardware memory allocation, which simplifies processing of data structures, subroutines and interrupts. The minimum stack address is 400, the same as in the SM 3-20 and SM 4-20. It can extend as high as an upper boundary of 32K words in 200-word increments (400 bytes).

The cache memory accelerates processor access to stored data and instructions. The cycle takes less than 550 microseconds. The preselected section of main memory copied may be as large as 2,080 bytes. In addition to its speed, another advantage is its limitation of the use of the common bus, which creates room for transmissions between I/O [input/output] devices and storage. The programmer's console, part of the permanent equipment supplied with the processor, simplifies the work of both the operator and the technician. It allows operations with the processor registers and all memory cells in main storage. Standard functions allow direct initialization of the program of a loading module or the start of a selected diagnostic module.

The priority system has four levels, to each of which a relatively unlimited number of devices may be connected. Their priorities are determined by their physical locations: the closer to the processor, the higher the priority. The system uses a stack in which the processor stores the important program information in case of an interrupt, allowing automatic return to the same program location under the same conditions as before the interrupt.

The common bus interface, which allows communication between individual system components, is asynchronous, and accordingly is suited to use with devices of different speeds. The 4K words of memory allocated for I/O can be expanded to up to 32K words for special uses.

The nucleus of the error-detection system is the set of registers. In case of an error, the information stored in these registers allows it to be rapidly located and analyzed. If an error occurs in cache memory, the optional FPP (see below) or the user-accessible control store, these modules can be disconnected. The system can continue operating, although with a limited instruction execution speed. The power loss protection feature is put into operation by a processor vector if the line voltage drops below 190 volts. Program execution is suspended and the power-loss program stores the data contained in the registers, as well as the state of the peripheral devices. When the power is restored, an interrupt vector is used to start the power-on program and restores the status of the system before the loss of power. In some extreme cases a load module may be used.

The basic processor can be expanded with the following optional modules:

--An external FPP which operates asynchronously with the main processor, to whose internal bus it is connected. When it is connected, the internal FPP is disconnected. Arithmetic operations are performed in parallel at high speed, which greatly increases the power of the system in processing floating-point instructions. This is particularly suitable for use in complex scientific and technical computations.

--The user-accessible control storage, an expansion of the processor's control memory; only one of three possible variants can be installed:

--a. The RAM-type user-accessible control memory with suitable software, designated WCS, has a capacity of 1,024 microwords and is used to create and debug user programs. The width of the control word is 48 bits plus 3 parity bits, while a data work consists of 16 bits plus 1 parity bit. Odd parity initiates a check.

--b. The PROM-type expanded control storage, designated ECS, has a maximum capacity of 1.5 K and a control word length of 48 bits, and can be used to store user microprograms.

--c. The ROM-type diagnostic control memory, designated DCM, with a maximum capacity of 2K words and a control-word length of 55 bits, is used for microprogram testing of the main processor and error location in a given module and its integrated circuits in the DCS itself.

All accessories usable with the SM 2301 and SM 2401 (SM 3-20 and SM 4-20) can be used with the SM 1403 processor. All programs developed for the SM 3-20 and SM 4-20 can be used with it.

Basic Parameters of the SM 52/11

Maximum usable main storage	124K words
Size of cache store	1K words
Total numbers of registers	92
Total number of ALU registers	80
Instructions	139
Number of interrupt levels	4
Byte	8 bits
Word	16 bits
Optional I/O page	4K-32K words
Standard I/O page	4K words
Register-register operation time through cache memory	0.34 microseconds

Comparison of time required for accumulator-accumulator operation using cache memory and floating point operation with internal and external FPP (microseconds):

Item	Internal FPP	External FPP
ADD	4.8-110	0.68
MULD	200-238	3.06
DIVD	240	12.41

NMOS Main Store

This is a self-correcting semiconductor store with a capacity of 28 Kbyte with a 64K word module. It can be expanded to twice the capacity, i.e., to 128K words. Within the SMEP configuration it is designated SM 3511. This memory detects all double errors and some multiple errors and automatically corrects all simple errors. Within the 128K-word capacity, access to subsequent words may be blocked. The modularity is 16K words, and the word length 22 bits, including 6 control bits.

Common Bus

This bus allows connection of individual system components and communication between them. A unified communications method is used: for example, the processor uses the same set of signals for communication with storage as does the peripheral equipment; the same is true of communications between peripherals and the processor, and so on. Communication along the common bus is asynchronous and works in the handshake mode. The devices connected to the bus have different priorities, and subordinate devices must always yield to superior devices.

Within the SM 52/11 system the following external storage and I/O support modules may be used:

--A simple time clock is an optional expansion module which, in combination with the processor, is used for generating interrupts at 200-millisecond intervals.

--The SM 2001 programmable time closk is an optional expansion module which, in combination with the processor, generates precision time intervals, measures time intervals and generates pulse trains.

--The SM 5105.7 disk-pack-store controller allows 1 to 4 SM 5400 or SM 5403 disk stores with a capacity of 2 x 2.5 Mbyte to be connected to the system.

--The SM 5001 magnetic tape store controller allows 1 to 4 SM 5300 (capacity 100 Mbyte) or SM 5302 (capacity 200 Mbyte) magnetic tape drives to be connected.

--The SM 5605 floppy disk external store includes a controller and power supply and two 512 Kbyte disk drives.

--The P80-8 parallel adapter, SM 6001, allows a tape reader-punch, keyboard, matrix printer, line printers or displays to be connected to the system if they have access to an 8-bit IRPR interface. Transmission is asynchronous and the maximum speed is 300K b/sec.

--The PAD-12 parallel adapter (no SM designation as yet) allows card readers to be connected with the system if they have access to the IRPR 12-bit interface.

--The PAD-16 parallel adapter (no SM designation as yet) allows accessory 16-bit equipment such as the Digigraf drawing table, the Digibak-5T or a digitizer to be connected to the system. The maximum asynchronous transmission speed is 300K b/sec.

--The ASAD asynchronous serial adapter, SM 6002, allows transmission equipment to be connected to the IRPS interface (universal current loop) or the S2 interface (CCITT recommendation V.24). The maximum transmission speed is 9600 bits/sec.

--The quadruple SAD, QASAD, SM 8512, allows connection of up to four transmission devices having IRPS or S2 interfaces. The maximum transmission speed is 19,200 bits/sec.

--The SAD synchronous adapter, SM 8506, allows devices using serial asynchronous transmission to be connected to the common bus or the system to be connected into a computer network.

--The AMU (AMUX) asynchronous multiplexor, SM 8511, allows up to 8 (or 16 with expansion) serial asynchronous transmission devices to be connected to the common bus if they have the IRPS or S2 interface.

--The MDS 200 modem (no SM designation as yet) allows asynchronous transmission at a speed of 200 baud. It is suitable for connecting matrix printers with the SM 7108.7 keyboard.

--The MDS 1200 modem (no SM designation as yet) allows remote connection of video terminals and connection of SMEP minicomputers into the network. The maximum transmission speed is 1,200 baud, or 75 baud in a backward channel.

--The SM 8105 null modem allows local connection of terminals with S2 interface to the SASD or AMU; it replaces standard modems.

--The SM 6208 tape reader-punch contains control electronics for access to the IRPR interface, allowing input at a maximum speed of 300 characters per second and output at a maximum speed of 50 characters per second, using 8-track paper tape.

--The EC 6112 card reader allows entry of data from punched cards with a maximum speed of 200 cards per minute; it is connected to the PAD-12.

--The SM 7601 input keyboard allows entry of alphanumeric data into the IRPR interface through the PAD-8.

--The SM 6303 matrix printer for serial output of alphanumeric data is furnished in several modifications. It is connected through the PAD-8.

--The SM 7108 matrix printer and keyboard unit for input and output of alphanumeric data has a maximum printing speed of 30 characters per second in a 132-character line. It is connected through the PAD-8. The model designated SM 7108.7 allows remote interfacing and is connected through an ASAD (IRPS) or through an ASAD and modem.

--The SM 6313 line printer allows output of alphanumeric data at a speed of 660 lines of 136 characters per minute. It is connected to the PAD-8.

--The SM 6315 line printer is a similar printer with a printing speed of 550 lines per minute.

--The SM 7202 alphanumeric display terminal with keyboard allows remote interfacing with the system and displays 1920 characters in 24 lines of 80 characters each. The data may be printed by connecting the SM 6303 output printer. It is connected through the PAD-8 or ASAD (IRPS and S2) or a suitable modem.

--The SM 1601 simple terminal display unit allows remote interfacing with the system and displays 1024 or 480 characters in a format of 64 x 16 or 40 x 12. It is connected through an ASAD or through an ASAD and modem.

--The SM 9402 numerical terminal allows remote entry of digital data (10 characters) with simultaneous display on a 14-digit field. This autonomous self-contained device has an IRPS or S2 interface and is connected to an ASAD or to an ASAD and modem.

--The SM 7404 vector graphic intelligent terminal allows a vector display on a 1024 x 1024 raster and is connected to the system via an IRPS or S2 interface. It contains the SM 2301 processor and a graphics processor, a graphic display with light pen, and a keyboard or display unit (SM 1601 or SM 7020). It operates under the DOS RV operating system.

--The planned SM 9101 external interface allows data connection in the continuous or intermittent mode from a process and its entry into the controlled process. It is designated the DASIO 600 and contains an internal control module, a converter, a commutator and the like, and input signal conditioning modules. It is connected to the system bus by an SM 9004 controller which has three alternate designs for different operating modes.

--The SM 0102 control unit for the IMS-2 allows control of the integrated control system and execution of the full set of commands for the IMS-2 functions.

--The SM 9205 laboratory process interface unit allows collection of analog signals from laboratory research apparatus and output of analog signals to a controlled process. Input is via an 8-channel multiplexor, an amplifier and a 12-bit analog-digital converter. An oscilloscope with memory functions or BAK-5T analog recorder can be used for output.

--The CAMAC [a European multiplex interface standard] rack control unit allows control of the minicomputer system rack with a common bus. It is designed as a module and is plugged into the control frame in the control-unit position. It is connected via a cable.

Software Resources

The software resources developed within the SMEP program are subject to no such memory capacity limitations as in the SM 3-20 when they are used in the SM 52/11 system. The available operating systems include:

--The FOBOS disk-operating system, two-program or one-program type for one user, intended for interactive program design in on-line applications. It allows operation in Macroassembler, Fortran IV, and Basic. When Basic is used, the system can service up to eight users through terminals; chain, laboratory or graphic peripherals can be used.

--The DOS RV2 high-speed system for an extremely wide range of applications in a dynamically changing environment. It provides memory protection, memory allocation, multiuser operation and user programs, overlay of program segments in memory, file protection and multiprogramming. It is suited for rapid effective installation and direct use at a high user-oriented level, but can also be used for tasks at a lower system level.

--The DIAMS disk-oriented system for creation of information systems and data bases in the dialog mode with multiple user access. This is a user-oriented multiprogramming time-sharing system. In the modernized version intended for the SM 52/11 it is capable of simultaneously serving more than 60 users and connection with up to 81 terminals.

--The TMOS operating system, intended solely for testing and diagnostic purposes; it allows a complete system testing.

Other available software resources include:

--the SYRPOS system for computer network control;

--the PPPD system for data preparation, preprocessing and transmission;

--a system for operating under the OS DOS RV2;

--a set of programs for scientific and technical computations;

--the SMGRAF set of programs for servicing graphic displays;

--program resources for user microprogramming;

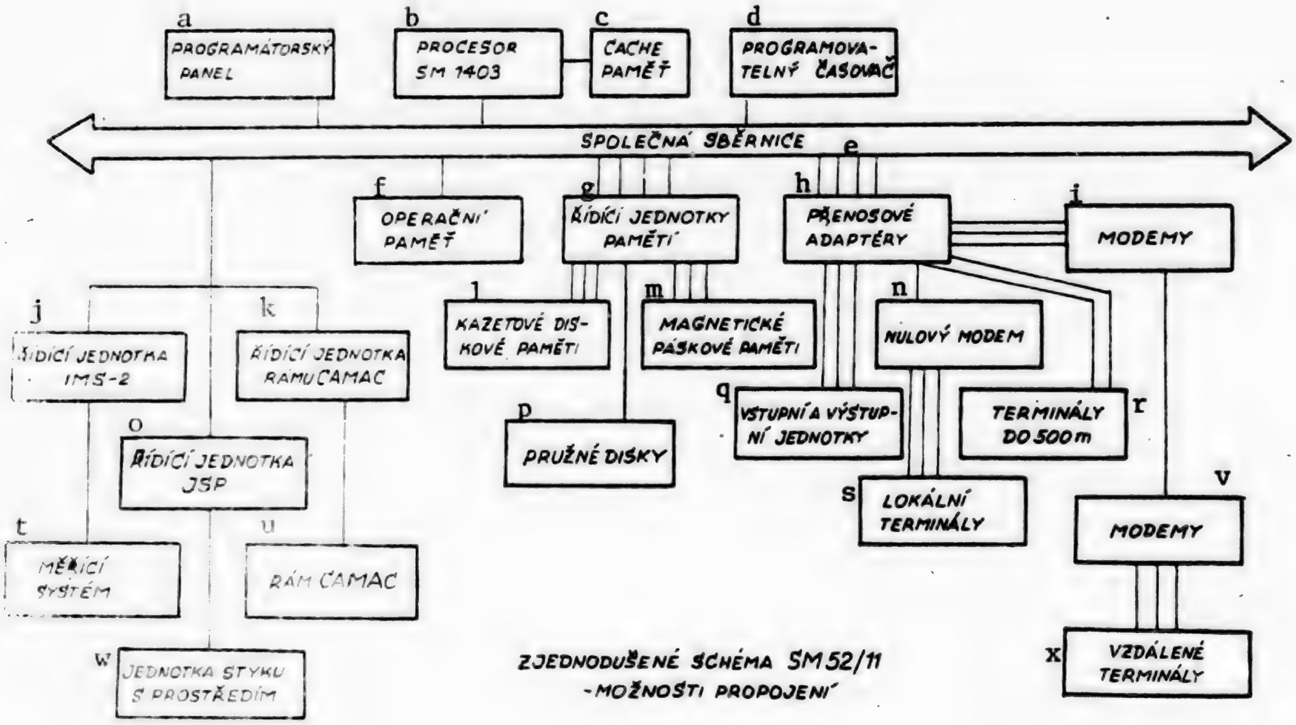
--the MICRO-52/11 assembler, operating under the DOS RV operating system;

--the MLD program loader for operation under the DOS RV operating system;

--the MDT loading program which operates independently, without an operating system.

Macroassembler, Fortran IV, Fortran IV-Plus, Basic Plus-2, Basic, COBOL and Microassembler can be used.

To conclude this brief survey we may state that the information presented was collected from the newest available documentation, which consists of articles and information from staff members of VUVT [Research Institute of Computer Technology] in Zilina, and of ZVT [Computer Equipment Plants] in Banska Bystrica. Possible refinements in the development of the SMEP II program made by ZAVT [Automation and Computer Plants] concern, and its subordinate management organs may result in changes in some of the data presented, but their effect would not be such as to fundamentally change the design or power of the system or invalidate conclusions and decisions by prospective users on the basis of the present information.



Simplified Block Diagram of SMEP 52/11: Possible Interconnections

Key:

a. Programmer's console
b. SM 1403 processor
c. Cache memory
d. Programmable time clock
e. Common bus
f. Main store
g. Storage unit controller
h. Transmission adapters
i. Modems
j. IMS-2 controller
k. CAMAC rack control unit
l. Disk pack store
m. Magnetic tape store
n. Null modem
o. JSP controller
p. Floppy disk units
q. I/O units

Key to Figure (Continued):

r. Terminals, up to 500 m
s. Local terminals
t. Measuring system
u. CAMAC rack
v. Modems
w. Process interface unit
x. Remote terminals

8480
CSO: 2402/60

SYNTHETIC PHEROMONES PROGRAM OUTLINED

Bratislava CHEMICAL REVIEW in English Apr 82 pp 23-24

[Article by Ing. Rudolf Bezak]

[Text]

Problems associated with the nutrition of mankind are the main cause of the adverse antropogeneous intersentions into living environment in the effort for maximum utilization of soil fund. The most adverse environmental impact are the result of the mass application of pesticides in the fight against plant pests. Another serious consequence of improper application of pesticides is the formation of a resistant population of pests as well as the side effect of these non-specifically functioning substances on useful insect and naturalenemies of harmful insect affecting thus the biological equilibrium in nature. One of the most serious consequences of the mass application of pesticides is the increased quantity of these substances in plant product endangering directly or indirectly the human health.

There is an increasing number of specialists and leading personalities of social systems who are engaged in the problems of the reduction of pesticides in plant protection.

One of the methods of reducing the pesticide consumption is the utilization of synthetic pheromones as the intra-species means of communication.

In the recent time special attention is paid to the communication substances of insect, particularly to the sexual pheromones, especially in harmful species. Knowledge of the basic research penetrates promptly into practice and in a number of developed countries extensive research projects aimed at the utilization of pheromones for mapping the occurrence of pests and controling chemical fight against the pests within the so called channelled or integrated plant protection are carried out.

The current programme of the studies on pheromones in the CSSR is focussed particularly on the utilization of pheromones for mapping the pest occurrence and controling the chemical protection although (especially in forestry) experiments are carried out concerning the utilization of pheromones as the means of direct pest control.

The basic research of the pheromone synthesis is carried out in the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences and the Entomological Institute of the Czechoslovak Academy of Sciences in Prague. At present, a laboratory preparation of two pheromones has been mastered one of which can be used for the signalization of the codling moth flight and the second for spruce bark beetle control.

The method of signalization of the male codling moth flight employing the pheromone traps is an important way for channelling the protection of the kernel fruit orchards against these pests.

Information obtained by means of pheromone traps can be used for a more precise determination of the target application of the pesticide. Focusing the chemical fight against major pests entails considerable savings when considering the number of sprayings as well as the volume of pesticides applied. This fact is of great importance not only from the economic point of view but also from the aspects of the living environment protection.

Practical application of pheromone traps — besides the large-scale production — can be successfully employed by private growers — gardeners — because of the simple attendance.

The selective method of the spruce bark beetle control by means of the pheromone traps is a very important means in the protection of spruce growths against this dangerous pest. When using the pheromone traps, the fight against the bark beetle becomes more intensive without using pesticides.

In case of the spruce bark beetle swarn the pheromone traps can be used successfuly used for selective catching and subsequent mechanical eradication.

The problems of prompt introduction of pheromone traps for the signalization of the codling moth flight and spruce bark beetle control to practice are solved by the following institutes: Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences, Prague — it deals with laboratory synthesis and formulation of pheromones (basic research); Entomological Institute of the Czechoslovak Academy of Sciences in Prague —

dealing with the basic materials for the implementation of monitoring systems including materials for final approval; Research Institute of Inorganic Technology in Bratislava — dealing with application research, production and application of pheromones including their registration; Commercial Organization Chemika Bratislava — ensuring pheromone adjustment and planning to start also the production of required active substances as well as the production of pheromone auxiliaries including commercial activity.

Other institutions taking part in the solution of above problems are: Central Inspection and Testing Agricultural Institute, Prague, Central Inspection and Testing Agricultural Institute in Bratislava, Ministry of Agriculture and Nutrition of the CSR, Ministry of Agriculture and Nutrition of the SSR, Research Institute of Forestry and Hunting Strnady, Research Institute of Forestry Zvolen, Research and Breeding Institute of Fruits Holovousy and others.

To promote a permanent development and production of pheromones and their efficacious introduction to practice, materials are under preparation for formulating a state project oriented to continuously decreasing the use of pesticide. An original solution of the production of active substances might open possibilities for the export of the preparations for Pheromone tramps.

Successful development of these preparations will enable the CSSR and other countries of the socialist community to introduce more modern methods of plant protection meaningfull from the aspects of the living environment improvement, cost savings in the sphere of pest control and finally as an important antiimport measure.

CSO: 2020/57

RESEARCH, DEVELOPMENT OF PLANT PROTECTION PREPARATIONS

Bratislava CHEMICAL REVIEW in English Apr 82 pp 17-19

[Article by RNDr. Stefan Varkonda, CSc.]

[Text]

Research and development in the production of chemical agents for plant protection in the CSSR in the fifties and sixties considered especially the needs of the quickly developing socialist agricultural large-scale plant production. According to the results of the Research Institute of Agrochemical Technology in Bratislava which has become the leading institution of the scientific and technical development with inter-sectorial competence in the field of pesticides, more than 25 preparations were introduced into the production by the end of the 5th Five-Year Plan. Permanent re-evaluation of individual products from the aspect of ever demanding criteria typical for the this field, resulted in the fact that only about one firth from this assortment is manufactured today.

The urgent need for an insecticide against Colorado beetle and other pest control, herbicides for the wild oat control and a more universal type of fungicide was expected to be met by Decemtion EK-20, Fatex EK-50 and Novozir Mn-80. This programme was completed on the research basis already at the beginning of the seventies and is known as Agro II.

In the next period the research was dealing with the production of phenoxyherbicides MCPA and MCPP, triazine and some other herbicides including the necessary intermediates. This conception together with Agro II should ensure the key assortment of preparations for the protection of the most important crops. Import of preparations from non-socialist countries would be substantially reduced and at the same time conditions for the specialization of the CSSR and for its more active participation in the cooperation within the CMEA member countries would be established.

Agro II is to be implemented in Duslo Šaľa. After building up the production capacities the assortment of home preparations for plant protection will be enlarged by the above mentioned three preparations as well as by the original Czechoslovak systemic fungicide known as Fademorf EK-20.

Decemtion EK-20

Already in 1963 the first strains of Colorado beetle resistant against the preparations on the basis of chlorohydrocarbons were selected in Slovakia, too. Not even treatment improvements and additions of antiresistant agents did lead to satisfactory results. Therefore, the researches started to develop the technology of phosmet (O,O-dimethyl — S)phthalimidimetyl(dithiophosphate) and its final form known under the trade mark of Decemtion EK-20. It is an insecticide and acaricide with contact, fumigation and partly also in-depth effects. It was described for the first time in 1961 and started to be manufactured by the Stauffer Co. in 1966 under the trade mark of Imidan. The technology realized in Czechoslovakia enables to manufacture phosmet of 97—99 % purity.

The originally planned scope of application of Decemtion EK-20 was considerably extended. It is used with success not only in Colorado beetle control (including larvae) but also for blossom beetle control on rape, control of moth en fruit trees, slugworm and aphid control, for protection of vines, vegetables and ornamental plants. In several preparations it can replace the hitherto used Metation EK-50.

According to the WHO classification it ranks among substances with medium toxic effects. As it degrades easily and has less toxic effects on predators of mites, it might be applied in the selected systems of integrated plant protection. The preparation does not leave any undesirable residues in the living environment.

Fatex EK-50

Wild oat spread out in the CSSR to such an extent that at the end of sixties the control of this weed decreasing the yields became part of agrotechnique of growing some plants. However, all herbicides used for its control had to be imported — mostly from capitalist countries.

Therefore, The Research Institute of Agrochemical Technology has elaborated materials on the production and application of chlorophenpropmethyl (methyl ester of 3-(4-chlorophenyl)-2-chloropropionic acid). The final product containing 50 % of active substance is known under the trade mark of Fatex EK-50. The technology enables to manufacture chlorophenprop-methyl of 96—97 % purity.

It is a specific herbicide with contact effects and therefore it is used for postemergence control of wild oat. The weed disappears 14 days after application. The preparation can be applied to barley, wheat and sugar beet showing a good tolerance to it when applied in recommended doses. When properly applied it does not leave any residues in the culture. According to WHO it is a preparation with low or even zero toxicity. It is expected that more than 100 000 hectares will be treated with this preparation every year.

Novozir Mn-80

Fungicides represent a very significant item in the import of plant protection preparations. Our assortment is represented only by preparations on the basis of copper and sulphur compounds. In the meantime a number of newer contact and systemic fungicides appeared in the market. The research programme of the Research Institute of Agrochemical Technology (VÚAgT) involves technology of the production of mankozeb (manganese-zinc ethylene bis-dithiocarbamide) which will known in the market under the trade mark of Novozir Mn-80.

This is a fungicide with protective effects and a wide spectrum of application. It is designed for protection of several cultures such as potatoes (even during storing), vrapevine, tobacco, wheat, roses and the like. The preparation will not only considerably reduce the costs for import of similar preparations but it can be applied to such treatments which have not been performed till now.

The technology proposed by VÚAgT enables to manufacture the preparation with a purity of 90—93 %. It is expected that the preparation manufactured will not contain high amounts of undesirable ethylene thiourea and will be applied also in such crops where its application was not envisaged because of hygienic and toxicologic reasons.

Fademorf EK-20

Among the most significant results of the Research Institute of Agrochemical Technology in the seventies is the discovery of fungicidal properties of N/1-phormamide-2, 2,2-trichloroethylmorpholine. Successful research on biological properties and the toxicologic studies provided a sufficient amount of material resulting in the decision to desing the technology for its production.

The active substance generally konwn as trimorphamide is applied as a 20 % emulsion concentrate known under the trade mark of Fademorf EK-20.

Availability of the preparation from the pilot-plant production enabled to carry out an extensive biological investigations also under climatic and soil conditions of other CMEA member countries. Due to this, the preparation has already been registered in the USSR and Romania and its registration in the GDR, Poland and Hungary is expected in the near future as well. This confirms also the expectations as for its eventual export.

The original Czechoslovak fungicide is effective for the control of powdery mildews of apple trees, grapevines, tobaco, cucumbers, goseberries, roses and also its aplication to barley protection is possible. This is a substance with systemic properties. After application it does not remain on the plants but penetrates into the tissues and through the vessel system it reaches also other parts and organs protecting thus the whole plant. It has not only protective effects but also curative ones. As for its acute toxicity the preparation is classified according to the WHO classification among substances with low toxicity. The active substance has not cumulative properties and is decomposed relatively quickly after its application.

According to the toxicologic research studying not only acute effects but also, mutagenic and carcinogenic effects, effects on warm blooded animals, etc. no unfavourable parameters were recorded.

Its production is scheduled to start in 1984 in Duslo Šaľa providing thus a product suitable not only for the Czechoslovak agriculture but also for eventual export.

The results of the current applied research of VÚAgT should be soon reflected in further improvement of the preparations on the basis of atrazine, MCPA and chloridazone. It concerns particularly improvement as for their application as well as reduction of their possible harmful effects on the living environment.

Research and subsequent realization are engaged with rationalization of the production of these preparations. Necessity of further development of research, development and production of plant protection agents is emphasized in the target outlined at the 15th and 16th Congresses of the Communist Party of Czechoslovakia concerning the increase of the self-sufficiency in the production of agricultural products. Chemical protection takes here an important and hitherto unreplaceable position. With respect to lower investment possibilities further development of pesticides should be considered more comprehensively. Within the framework of Slovchémia a conception is being prepared which should establish conditions for increasing the export, for specialization and cooperation within the frame of socialist countries. The most important aspect is that of raw material supply which is important from the aspects of decision whether to adopt the variant of complete production from the beginning or the way of cooperation.

In the next years the applied research of VÚAgT should take up the outputs of basic research of the Czechoslovak Academy of Sciences and the Slovak Academy of Sciences as for the substances of new generation and some biopreparations. It is expected that the solution of production and application problems associated with the above mentioned preparations will result in a distinct increase of the level and economy of plant protection with significant positive impacts on the living environment protection, too. This aim corresponds to the world trends.

CSO: 2020/55

PESTICIDE APPLICATION TRENDS

Bratislava CHEMICAL REVIEW in English Apr 82 pp 20-22

[Article by Ing. Frantisek Richter, CSc., Ing. Vaclav Peterka]

[Text]

In the period of the construction of a developed socialist society the Czechoslovak Socialist Republic has recorded a remarkable increase in food consumption — both of plant and animal origin.

On the basis of the programme of improving the living standard of the Czechoslovak population outlined by the 16th Congress of the Communist Party of Czechoslovakia, the main target of agriculture is to provide individual foodstuff articles and raw materials for their production while at the same time increasing the self-sufficiency. Increasing the production of foodstuffs through the domestic agricultural and foodstuff productions is a demanding target from the aspects of the application of available intensification elements — chemization, biologization, mechanization and the like. The agricultural production is intensified through gradual increases in the doses of industrial fertilizers per hectare of agricultural land in the whole country, introduction of high-productivity species of agricultural crops, improvement of pest control and protection against plant diseases, application of available preparations for weed control, improved cultivation of land, etc.

During the last thirty years the application of industrial fertilizers in the CSSR increased considerably. In 1980 as many as 255 kg of the NPK pure nutrients (nitrogen-phosphorus-potassium) were applied per hectare of agricultural land. Recently, a substantial improvement of soil reaction was achieved by liming even soils which were classified as strongly acid and thus, conditions for further improvement of fertilization were created.

Higher intensity of plant nutrition results usually in a higher fertility of individual plants, higher quantity of aboveground mass, but this provides also a better food basis for pests and diseases. The growth of harmful agents is also a function of the climate. Higher doses of nutrients (NPK) promote also the growth and development of weeds.

Chemization of the plant production is one of the most serious intensification factors in agriculture and has a significant share in the increase of yield per hectare. An important aspect of chemization in plant production is the chemical plant protection against pests, diseases and weeds, desiccation of the plant mass prior to the harvest of seed products, application of growth factors as well as other activities affecting the hectare yields.

The main task in the plant protection — besides the prevention of harmful agents — is the direct fight against diseases, pests, easily and less easily controllable weeds as well as chemical treatment to prevent lodging of cereals, and utilization of desiccation for drying prior to the harvest.

Plant protection against harmful agents is extending. In the CSSR the plant protection was extented particularly in the process of specialization and concentration of agricultural large-scale production. Under the present conditions it involves a very wide and demanding scope of activities. The current plant protection enables to reduce losses in the yields of individual treated crops and prevents the losses during the storing of crops and plant products. Chemical weed control and elimination of harmfull effects on crops enable to mechanize and rationalize the harvest and to apply the most modern large-scale technologies. Thus, also a better return of basic investments into the soil is ensured, such as the adjustment of water regimes of soils, genetic potential of soil, adjustment of soil reaction and other reclaiming activities.

Plant protection has become one of the basis factors which is decisive for the level and stability of agricultural production. Investments in the sphere of plant protection affect material costs as well as the final effect of the plant production. It has an operative character in the Czechoslovak natural conditions as very year has its specific characteristics with respect to the occurence of individual harmful agents.

Plant protection preparations — pesticides — have bocome part of large-scale technologies. The development of new pesticides during the last 25 years ahs recorded remarkable results and the forms and ways of application are constantly improving. The decrease of yield losses recorded due to the application of fungicides against plant diseases, insecticides against pests and herbicides against weeds has been estimated to about 20 % in the world.

The advantage of chemical plant protection praparations is that they can be used for the treatment of large areas by means of heavy-duty machines, sir planes and helicopters which enables prompt and operative management of the situation.

Pesticides are employed in agriculture, forestry as well as human medicine, communal hygiene for foodstuff protection, against the pests of stored plant material and for disinfection, disinsection and deratization (DDD). A special chapter is that involving sanitary measures during transportation of contaminated plant material on ships and other means of transport.

During the last years, the application of pesticides has been extended practically to all agricultural plants. The role of practical plant protection consists in the application of such methods and preparations for plant protection and harmful agent control which exclude or reduce the possibility of unfavourable effects on man, environment, fodder and food.

Experience of the last years has shown that chemical preparations for plant protection eliminate in many cases the negative consequences of concentration and specialization in the plant production, such as a higher occurrence of diseases, pests and weeds in case of a monocultural crop cultivation. More and moore frequently desiccants for chemical drying of plants and as morphoregulators of growth are applied, as they considerably influence the productivity of labour, quality and technology of the cultivation treated plants as well as that of their harvest.

Only those pesticides are used in practice which are contained in the list of registered preparations. Prior to their registration the biological activity of the pesticide is assessed as well as health and special toxicological and hygienic criteria, and criteria with respect to water and living environment protection.

New problems of the plant protection against pests, diseases and weeds require a higher number of chemical preparations, more efficient substances and their rotating application. This prevents the pests and diseases from developing resistance to preparations used for a longer period of time, or to the same efficient substances applied several times. Similary, the effects against resistant weeds are ensured which were spread by many years of application of chemical preparations containing the same active substance, or the preparations with the same spectrum of activity, e. g. MCPA, 2,4 D, atrasine, simazine, trifluraline and some others. Resistant weed control is performed by combination of the preparations immediately before the application ("tank-mix" method), or in-factory combination of several efficient compounds.

In the past, resistance to several pests of economical importance was observed in practice when combining pesticides. The rotation of pesticides prevents the cumulation of substances in the living environment which is of great importance from the aspects of hygiene and water management.

Application of chemical plant protection preparations in order to enable introducing a new technology of harvesting the crops and growth regulation of agricultural plants is carried out at a scientific level. Inevitability of their application is pointed out by the staff of inspection institutes and management sphere. This activity will expand more widely in the future.

Plant protection preparations for practical applications have different forms. Besides the classical dispersive, wettable powders, emulsifying concentrates, liquid concentrates for dilution in water, water-soluble or solid concentrates, liquid dispersable concentrates for dilution in water, powder and liquid mordants, there are special forms of preparations for application in very low doses, the so called ULV, tablets, dispersive microcapsule concentrates, aerosol containers, granulates, bags, strips or plates releasing the active substance, coating materials and other special forms.

Special demands put on the plant protection activities, observation of rules for correct application as well as comprehensive living environment protection require that the activity in the field of plant protection be performed by specialized organizations equipped with necessary technical means and qualified personnel. In the CSSR this service is performed by agrochemical enterprises, machine and tractor stations, special organizations of DDD (for the protection of stored reserves of vegetable material) and by special groups of agricultural plants.

A relatively high rate of the development of chemization in the plant protection with the corresponding growth of the plant production was recorded especially in the first half of the seventies. In 1970—1975 the annual increment of chemical treatment represented 13 %. In the period 1976—1980 certain stagnation was taking place. In this period also the home production of pesticides started and continues to stagnate.

Stagnation of the pesticide production and shortages in their assortment have unfavourable impact on the present level of protection of cereals and other crops. It is necessary to perform weed control in all crops grown on arable land. It is necessary to weed all kinds of cereals, maize for grain and silage, legumes, potatoes, sugar beet, winter rape, sunflower, flax, soya, poppy, other seed oil crops as well as of hemp, tobacco, red pepper sorghum, chamomile and spring mixed crops. It concerns also feed tuber crops, hop- gardens, vineyards, stone fruit and pome fruit orchards, tomatoes, cucumbers, onion, garlic, strawberries, cabbage, carrot, spinach, lettuce and other vegetables.

The Czechoslovak chemical industry manufactures three active substances for herbicides which is not enough to cover the requirements. Therefore output from the production programme Agro II and Agro I from Duslo Šaľa, Natl. Corp. should improve total plant protection with herbicides, fungicides and insecticides.

In cereals as well as in other crops monocotyledonous and other resistant weeds are selected. A serious problem of the last years causes coushe grass which is almost the limiting factor of crops. It occurs mostly in the regions of North Bohemia, East Bohemia, North Moravia as well as in the East Slovakian and Mid-Slovakian regions.

Besides the herbicide programme it is necessary to develop also the programme of special fungicides for field crops, vegetable, fruit growing and vine-growing. As for the insecticides it is necessary to develop production of preparations against voracious and suckling pests including mites.

Experience of the last years shows the necessity of a substantial elargement of the assortment of fungicides with preventive effects and addition of new, specific fungicides with curative effects which find application possibilities in case of serious infections of individual diseases.

Of the total volume of chemical plant protection in the CSSR, weed control by herbicides amounts to 59 %, 15 % by fungicides, 15 % by growth morphoregulators, 8 % by insecticides, 2.8 % by desiccation and 0.2 % by rodonticides.

Herbicides were used for some plants even twice, particularly in case of weaker effects in dry periods, when imported contact herbicides were applied especially to sugar beet, vegeables and other crops.

When considering the total development of plant protection in the CSSR it is clear that a thorough comprehensive solution of the problems is required. The decisive turn in the unsatisfactory situation with pesticides supply should be made especially by increasing the home production. At the same time, this is a prerequisite for a more extensive utilization of the possibilities offered by the international cooperation within the framework of the Council of for Mutual and Economic Assistance.

CSO: 2020/56

WEED CONTROL IN FORESTRY

Bratislava CHEMICAL REVIEW in English Apr 82 pp 25-30

[Article by Ing. Olga Valkova, CSc.]

[Text]

One of the many products of chemical industry are pesticides the application of which has been considerably expanded also in forestry during the last decade. The present modern protection of forests is hardly possible without application of pesticides as chemization is of undeviable importance for the whole national economy including forestry. When comparing the amount of applied pesticides in agriculture and forestry, the latter is rather low (ranging from 0.5—1 %); however, it becomes more and more important as the forest fulfils significant functions (water source, air pollution control, etc.) in the present era of scientific and technological progress.

The most important chemical preparations applied to forestry are *phytocides*, i. e. preparations for plant vegetation control. These include *herbicides* (weed control), *arboricides* (undesirable bushes and trees control), *defoliants*, etc. The most frequently applied herbicides and arboricides in forestry are those on the basis of phenoxyacids 2,4,5-T and 2,4-D, dalaphone, TCA and some triazine compounds. Natural environment is mostly influenced by insecticides followed by herbicides and fungicides. Herbicides include particularly the triazine-based compounds, urea derivatives and picloram, criticized because of their residual effects or degradation of toxic residues in soil. Due to a relatively long persistence one should mention here trifluraline, dalapone and TCA. Among ecologic factors influencing herbicide behaviour in soil also sorption capacity, organic matter content, biological activity of soil microorganisms etc. should be mentioned here in addition to climatic conditions.

Chemical control of undesirable plants (weeds) started practically after World War II, when the application of insecticides was quite common. Since that time, however, application of herbicides is ever increasing the same as the prognoses predicting an increase in their absolute and relative share in the aplication of all pesticides in the nearest future. It has been demonstrated that the application of herbicides in forestry results in an increased productivity of labour, reduction of total costs and share of live work (as much as 50 %). Thus, herbicides are important chemical agents even in this sphere of national economy. One should realize, however, that the application of herbicides has also negative effects. Like any biocide agent also herbicides can have unfavourable effects. Then can involve also direct or individual risks for human organism (Válková 1975).

One of very serious factors negatively influencing the production of seedlings in tree nurseries and rooting of seedlings is the incidence weeds.

There are many studies in the world literature on forestry (Smirnov 1971, Wilde et al. 1968, Böhm 1973, Ciannini 1973, Huss et al. 1970, etc.) dealing with the negative effects of excessive weed growth (excessive production of phytomass) in relation to nutrient intake, water consumption and decretion and decrease on quality (smaller growth in height and thickness) of seedlings and plants. Sometimes the weed provides certain protection to young woods (slight shade, reduction of temperature differences and the like), early budding species can be the only source of fodder for animals in spring, and the like. Positive aspects of weed growth are, however, outweighted by its harmful effects on the development of seedlings and young plants.

Application of herbicides and phytocides in general is becoming ever more important as the forest is an important factor in the area of springs, it is important for air protection, recreation, etc. In the last few years the application of herbicides to forestry was criticized not only by specialists but as well by public at large. Response of the public is frequently emotional without sufficient information, based on certain press campaigns, etc.

Regarding the fact that the permanent tendency of rationalization in forestry needs the help of chemical industry, we have to count on the application of pesticides in the nearest future, too. It is necessary, however, to use less persistent and less toxic preparations, to keep exactly the quality and technology of the application so as to prevent any emergencies that might seriously shift the biological equilibrium of the forest ecosystem even for a longer period of time.

To the efficient, the struggle against undesirable vegetation must become part of a whole complex of measures that must be strictly observed. One has to take into consideration, however, that the methods of control depend on the particularities of biology [illegible] individual weeds as well as on the whole complex of the environmental conditions. Total weed control presupposes the study of biological properties of the weed species, i. e. the way and intensity of reproduction, the way of spreading the reproductive organs, regeneration capability and vitality of the organs of vegetative reproduction, relations of weeds to ecological conditions, sensitivity of the weed species to applied mechanical and chemical methods. The system of weed control is an unseparable part of the total integral plant protection in the CSSR.

Recently, attention to perfect knowledge of biology and ecology of weed species is paid also abroad as herbicides can be employed for weed control only with the knowledge of all relevant data. In the German Democratic Republik there is a research project dealing with the problems of the study of weed biology in forestry; Klebingat (1967) carried out phenological investigations on forest weeds and examined the process of germination of the seeds of some weeds in different depths of soil. At the same time, Klebingat (1970) notes that the konwledge of harmful effects of weeds and the conditions of their germination is the basis of systematic and rational application of herbicides to forestry.

In the tree nurseries the weed control costs represent a substantial part of total expences, and it is necessary to pay more attention to new rationalization methods as it is exactly in the tree nurseries where the requirements for manpower are significantly affected.

Among prevailing species of weeds we must mention at least some, such as annual meadow grass (Poa annua), Sagina procumbens chickweed (Stellaria media), shepherd's purse (Capsella bursa-pastoris), common groundsel (Senecio vulgaris), corn spurrey (Spergula arvensis), etc. Among perennial species prevail particularly the following: Rorippa silvestris, creeping thistle (Cirsium arvense), couch grass (Elyrigia repens) as well as a number of others as resulting from examinations in individual tree nurseries. Each tree nursery has its specific spectrum of weeds which depends particularly on the environment of the tree nursery (e. g. vicinity of agricultural land, soil, altitude above sea level, cenotic classification, etc.

Problems appear with the occurence of the secondary flora when the application of a certain herbicide results in one-sided suppression of one part of vegetation which is followed by the selection of other resistant species that were suppressed prior to this application (Pluquot 1969). To eliminate these undesirable consequences, combinations of herbicides are prepared which have effects on a broader spectrum of species.

It is understandable that maximum attention is paid to the rationalization of weeding in the tree nurseries and therefore application of chemical preparations with selective effects in some wood species is welcome in the forestry practice. Recently, preparations on the basis of hexazione were found very good because of their selectivity to the pine tree (Photo p.). After the first experiments of safe applications to pine cultures this preparation started to be used in the tree nurseries, too. It was applied to the pine tree nurseries, then to the planted pines in the second year and finally, very low doses were used in the application to pine seedlings. Herbicides are applied particularly in the preparation of soil for afforestation where the intensive growth of weeds prevents the development of new plants. This way of weed control is one of the most desirable ones as it reduces competition of the weed vegetation in the first years of the development of planted trees. Serious problems are caused by monocotyledonous weeds such as Calamgrotis spigeios) L. (Roth) and Calamgrositis villosa (Chaix) Gmel.; of the dicotyledonous one should mention bilberries (Vaccinium myrtillus L.), heather (Calluna vulgaris L. (Hull.), Petasites albus (L.) (Gaertn.) and in some regions also Pteridium aquilinum (L.) (Kuhn). The wedd control during afforestation is followed by protection against weeds where it is necessary to pary attention to the selection of the preparation with respect to the treated target wood species, eventually to protect the cultural wood species against the effects of chemical spraying.

During 1977—1978 attention was paid in the CSR to the Pteridium aquilinum control in the area of the Vrchlabí forest plant. A series of experiments with some special preparations at different doses was carried out (some of them are selective for the above weed species):

1. *Aminotriazole* (50 % of act. subs. of amitrole) at a dose of 30 kg per hectare
2. *Asulox* (400 g of act. subs. of asulam) at doses of 6—11.4—27.5 l per hectare
3. *Garlon* 3A (300 g/l of act. subs. of triclopyr per liter at doses of 8—10 l per hectare
4. *Krenite* (420 g of act. subs. of fosamine ammonia per liter) at a dose of 10 l per hectare
5. *Velpar* 90 WSP (90 % of act. subs. of hexazinone) at doses of 6—8—10 kg per hectare
6. *Tordon* 225 Mixture (15.2 % of act. subs. of picloram and 14.9 % of act. subs. 2. 4.5-T) at a dose of 5 l per hectare.

A survey and comparison of the effects of individual preparations and their doses is given in Tab. 1. For completeness it is necessary to mention that above survey (because of the complicated method of calculation and weighing) does not include those preparation which did not show any effects on Pteridium aquilinum)

(e. g. Tordon, or their effects were rather insignificant from the aspects of utilization in practice

(Garlon 3 A at both doses, when the occurence of this weed on the treated areas was almost equivalent to those on the control area; only the fans were deformed and moreover some pine trees were damaged). Neither Krenite had any significant effects which was due to the time of application or some other factors. Detailed evaluation does not incluade Velpar at a dose of 10 kg per hectare as its effects on undesirable vegetation were almost 100 % (as in case of lower doses). However, from the aspects of economy the application is not a feasible one and also high doses against Pteridium aquilinum are not necessary. The herbicide effects were evaluated by taking five control squares of 1 m^2 from each experimental plot. From the values obtained mean m^2 was calculated (therefore the figures have one decimal place) and tabulated.

It is to be emphasized that the preparation given in the comparison table had no harmful effects on the pine trees. It is of interest that after the application of hexazinone-based preparations in areas with interspersed oak trees, the oak was not damaged either. It was necessary to distinguish between the effects on Pteridium aquilinum and those on other species so as to avoid misinterpretation of the results as some preparations have no effects on monocotyledonous species (Asulox). At the same time, the table indicates a low number of weed species when the dominating Pteridium aquilinum is able to suppress any other species — as is the case of other high weeds (e. g. Petasites albus —

which form a dense cover with their aboveground parts being thus serious competitors for the target wood species because of mechanical effects (pressure, shade) as well as because of excessive nutrients, light and air requirements.

Table 2 presenting data on the effects of hexazinone-based preparations applied to the pine wood — beginning of the application — documents the importance of a comparison of individual doses not only from the aspects of economy but also from the aspects of environmental protection: i. e. to prevent applying unnecessarily high doses of chemical preparations for weed protection in forest growths when — after comparison of the effects on

Table 1

Decrease in the weed intensity after treatment against (Pteridium aquilinum (L.) Kuhn)

Method: numbers — weight

Locality: LZ Vrchlabí (LS Nemojov)

Culture: Pine

Application: 11th July, 1977

Control: 28th Sept., 1978

Weed spieces		Pieces (veget, tops) on 1 m² plot						
		Dose in kg (liters) per hectare						
		ATA		AULOX		VELPAR		Control
		30	6	11,5	.27.5	6	8	
Agrostis vulgaris			0.6	0.2				
Avenalla flexuosa		0.2	22.0	0.2	1.4	1.4	0.6	27.6
Calamagrostis arundinacea			180.0					
Calluna vulgaris						0.6	0.2	
Chamaenarion angustifolium				0.2				
Pteridium aquilinum		4.0	5.8	0.2				
Rubus idaeus					1.0			
Vaccinium myrtillus		114.8	51.0	11.4	28.6	15.4	5.8	26.4
Vaccinium vitis-idaea		4.8		0.6	17.0			
Varia							0.2	
Total: Pteridium aquilinum	ks	4.0	5.8	.0.2	0.4	1.4	2,2	41.0
Others	ks	119.8	253.6	12.6	48.0	17.4	6.8	54.0
Loss: Pteridium aquilinum	ks	37.0	35.2	40.8	40.6	39.6	38.8	
	%	90.0	86.0	100.0	99.0	97.0	95.0	
Others	ks	+65.8	+199.6	41.4	6.0	36.6	47.2	
	%	+122.0	+370.0	77.0	11.0	68.0	86.0	
Dry matter weigh: Pteridium aquilinum	g	16.04	30.08	0.67	0.37	3.31	0.74	305.60
Others	g	84.67	70.15	3.93	30.53	6.37	5.63	17.76
Loss: Pteridium aquilinum	g	289,56	275.52	304.93	305.93 23	302,29	304.85	
	%	95.0	90.0	100.0	100,0	99.0	100.0	
Others	g	+66,91	+52,39	13,83	+12,77	11,39	12,13	
	%	+377,0	+295,0	78,0	72,0	64,0	68,0	

individual species — it is clear that higher doses do not extend the spectrum of effects. This can only result in the persistence of toxic residues of the active substances which must never happen to the forester using pesticides for wood species protection.

The above mentioned examples involve hexazinone-based preparations in the form of a wettable powder the effects of which on weed at the present selectivity in the pine woods are known among a number of people working in forestry. It is quite understandable that in some not easily accessible areas the transportation of water for preparation of spraying material is rather difficult, and therefore a hexazinone-based preparation in the form of granules was welcome as this enables application by special adapters without water. The active substance is absorbed from soil through roots, only rarely through leaves only if some granules remain on the surface of leaves only if some granules remain on the surface of leaves. This form is highly suitable for applications in afforested zones. Granulated herbicides find wide application possibilities in forestry especially due to the fact that no water is necessary for their application, as the transport of water is often very difficult in a complicated configuration of the terrcin. However, it is necessary to consider in which area such products can be applied as it was found in our experiments that the granulated preparations need sufficient moisture to be efficient. This has been proved also by experience abroad (e. g. Kerb). In our conditions we can recommend to apply the hexazinone-based granulated preparation early in spring (on the show) so as to make use of the soil moisture from thawing snow.

Table 2
Decrease in the intensity of weeds after VELPAR application at different doses
Method: number-weight
Locality: VLS Horní Planá
LHC Dobrá Voda, 41 a_2
Culture: Pine

Application: 25th July, 1975
(8 kg per hect.)
20th May 1976
(2,4 kg per hec.)
Control: 27th Oct., 1976

Weed species		Pieces (veget. tops) on 1 m² plot			
		Dose in kg per hectare			
		2	4	8	Control
Agrostis tenuis + stolonifera		1,0	1,3	1,0	(1429,7)
Ajuga reptans				1,7	8,0
Avenella flexuosa			0,3		(130,0)
Calamagrostis arundinacea					(2,7)
Deschampsia caespitosa			0,3		
Epilobium montanum			0,7		
Epilobium sp.					0,3
Epipactis helleborine					0,3
Fragaria vesca					4,3
Hypericum maculatum					5,0
H. perforatum					1,3
Luzula nemorosa					(8,0)
Moehringia trinervia				0,3	
Potentilla erecta					(3,0)
Prunus spinosa					0,3
Ranunculus lanuginosus				0,3	
Rosa sp.			0,7		
Rubus idaeus		0,3		0,3	(54,7)
Urtica diodica		(1,3)	0,3		(4,0)
Vaccinium myrtillus		(3,7)	(3,7)	(2,0)	(10,0)
Veronica chamaedrys					(4,7)
Viola silvatica		1,7		1,0	1,7
E_1 juv:					
Sambucus racemosa					1,3
Sorbus aucuparia					1,3
Weeds total —	pcs.	8,0	7,3	6,6	1671,0
Weed loss —	pcs.	1663,0	1663,7	1664,4	
	%	±100,0	±100,0	±100,0	
Dry matter — total	g	4,25	1,58	1,85	217,91
Loss of dry matter	g	213,66	216,33	216,06	
	%	98,0	99,0	99,0	

As for the control of some undesirable wood species we have to state that with respect to environmental protection these will have to be removed first of all mechanically (employing small mechanization) or by manual cutting, and only in justified cases chemical control will be allowed. In forestry, arboricide preparations are used for such a control — they are either sprayed on the trunk or leaves or special injectors or axes are used. Till now preparations on the basis of 2,4,5-T and some others have been used. The results obtained with the fosamine ammonia based preparations are not quite unequivocal in our studies because a thorough eradication and thus a serious evaluation requires at least two vegetation periods. This calls for a completely new view of the forestry practice as the hitherto experience with arboricides has shown relatively rapid effects already during one vegetation period. On the other hand the preparation on the basis of fosamine ammonia can be considered as a preparation of the second generation which requires a new approach of forestry and public as well.

At present, gyfosate-based preparation finds its application possibilities in the Czechoslovak forestry (360 of act. subst. per liter); it is a leaf herbicide with systemic effects. It is taken in by green parts of plants and through the plant liquors it is transported to the root system. It can be recommended particularly in such cases when persisting residues should be avoided in soil (e. g. in tree nurseries), as the preparation has no residues. However, there is a possibility of the development of the so-called secondary flora (see p.): the weed grows from the seeds remaining in soil, or such species of weeds can appear which were suppressed.

Maximum application possibility of this preparation is in the undesirable wood species control, eventually of their seedlings as from the aspects of the living environment protection no dilution in oil is necessary and water is used for coating or spraying. Application is quite safe (without intoxication) and oil is saved, too.

The prerequisite for positive effects of herbicides in forestry is a through knowledge on the possibilities of their application as well as on the risks involved in the herbicide application.

Herbicides — as any other biocide substances — can have adverse secondary effects. Some herbicides were criticized from the aspects of residual effects, or there are objections against hormone-type substances, and the like. Of course, the side effects of chemical preparations are not known during their development and sometimes it takes many years before they are found. And therefore it is necessary to avoid any mistake in the applivation of substances known at first as safe (direct exposure of man at handling, overdosing, water contamination, etc.).

In the conclusion we would like to state that in spite of some negative secondary phenomena brought about by herbicide application, they are and will remain an important factor for weed control in forestry. We have no means of replacing them — as is the case of the biological pest control which is in its first phase of development and finds application possibilities especially in the insect control. The biological weed control be performed in our geographic latitudes in the nearest decades (Jansen 1973). It is necessary, however, to employ the herbicides carefully; they should only complete the proper care and agrotechnics and all principles of integral protection must be observed during their application.

The forestry personnel of all categories must be familiar with the properties of chemical agents. When selecting the herbicide for application it is necessary to prefer less toxic ones or those with a lower ability to accumulate residues in soil, methods which contribute to the environmental pollution should be limited to minimum and even picking up fruits from areas treated by herbicides should be limited, and the like.

The above mentioned application possibilities of pesticides for forest protection at a minimum contamination of the living environment prove that there are ways and methods how tho restrict the danger resulting from the application of chemical agents to the forest ecosystem. On the contrary, purposeful and well-pondered application of pesticides — provided the fulfilment of all requirements for maximum reduction of the danger of side effects — will constitute an unavoidable component of forest cultivation and protection.

CSO: 2020/58

USE OF PESTICIDES IN FORESTRY

Bratislava CHEMICAL REVIEW in English Apr 82 pp 32-36

[Article by Ing. Miroslav Srot, CSc.]

[Text]

Losses in forest growths due to abiotic and biotic agents have considerably increased in Bohemia and Moravia during the last years. Continuous increase in emissions has a detrimental effect especially on coniferous trees which are invaded by a number of harmful biotic agents, especially various leafeating pests which occurred only sporadically in the past. For instance, larch shoot moth (Zeiraphera diniana Guen.) has prevailed since 1977 on vast areas in the spruce forests damaged by emissions in the Western region of the Ore Mountains, the Jizera Mountains and the Giant Mountains. Also the social spruce fly (Cephalcia abietis L.) prevails at present in the spruce forests of all regions of Bohemia and Moravia. In the spruce copses caterpillars of spruce sawfly (Pristiphora abietina Christ.) appear in high quantities. Gradation of pine moth (Bupalus piniarius L.) was recorded in 1980—1981 in East Bohemia in the region of the forest plant Vysoké Chvojno, the pine forests of which were also damaged by emissions on an area of about 1,500 hectares.

In order to prevent the proliferation of these pests it was necessary to perform extensive chemical treatment of the afflicted growth. While in 1970—1978 max. 5,000 hectares of forests were treated by airplanes in the CSR, in 1980—1981 the control of these pests was performed every year on total area of about 40,000 hectares.

Application of insecticides against defoliators is presently still the most economic and efficient way of the forest growth protection. Since 1944 mostly insecticides on the basis of chlorinated hydrocarbons were used for chemical protection in the CSSR and abroad; these preparations with DDT as active substance were highly toxic for insects eating up the assimilation organs of plants. First, they applied in the form of powders, later as aqueous and oil sprays. However, due to their high toxicity to warm-blooded animals, their long lasting residues and cumulative properties, the application of chlorinated insecticides to large areas was forbidden in 1974, the same as in a number developed countries. Therefore, it was necessary to test promptly other suitable insecticides which would replace the chlorinated hydrocarbons as for their effects on pests, but which would minimize the danger for warm-blooded animals and which would not pollute living environment. Preparations on the basis of organic phosphorus compounds were considered, followed later by insecticides from the group of pyrethroids and carbamates. Thus, for instances, in the USSR preparations from the group of organic phosphorus compounds, e. g. Chlorofos, Benzofosfát, Metylnitrofos, Bromofos, Gardona and the like were successfully tested against pine lappet moth (Dendrolimus pini R.), pine moth (Bupalus piniarius L.) and others (Yanin V., 1975, Vitalev A. 1975, Kuteev F., Andreeva G. 1972, Chramtsov N. 1977). During the chemical treatment also the toxicity of these preparations for soil vertebrates was observed (Atlavinite O., Kilik V., Yavichius A. 1978). In Poland effects of Actellic 50 EC, Ekamet 50 EC, and Owadofos on the caterpillars of gipsy moth (Lamantria Dispar L.) and gold tail (Euproctis chrysorrhoea L.) in oak forests were tested. Their application resulted in a more than 90 % eradication of caterpillars (Kaminski J., Karaszewska M., 1978). Extensive experiments were carried out in Poland in 1978—1980 with pyrethroid preparations (Ripcord 40 EC, Decis 2,5 EC, Ambush 25 EC and Cymbush 25 EC) applied by means of airplanes to pine forests against the caterpillars of blackarched tussock (Lymantria monacha L.). The chemical treatment was successful as the population density of these pests dropped by 90 %. In the last few years a new biotechnical preparation Dimilin 25 WP (active substance: difluorobezurome) was used in some European countries, e. g. in France and the Federal Republic of Germany; the preparation shows effects on the earliest developmental phases of caterpillars of defoliating pests, e. g. gipsy moth (Lymantria dispar L.), gree oak leaf roller (Tortrix viridana L.), processionary moth (Thaumetopoea processionea L.) and procession moth (Thaumetopoea pinivora Tr.) (Demolin G. 1978).

Also in the Czech regions a number of preparations from the groups of organic compounds of phosphorus, carbamates and pyrethroides were tested, as well as the biotechnical preparation Dimilin 25 WP and a new preparation from the group of nereistoxins Evisekt 50 SP: the preparations were applied by airplanes to forests against defoliating pests which have been controlled with success. Table 1 presents preparations which were used in the experiments, their active substance and manufacturers. To ascertain the biological activity of the tested preparations in the control of the caterpillars of defoliating pests in forests, 1 m long boughs were taken from the tree tops of sample spruces and live and naturally died caterpillars were counted prior to application. Similar analyses of the same sample trees were performed 5 to 10 days after the application. Natural mortality of the caterpillars was observed at the same time in untreated control plots.

Downfall sheets of 1 m^2 were placed under the top of trees in the plots to be treated and immediately after the application reactions of the fallen insects were examined.

Even before the chlorinated hydrocarbons were forbidden to be used, an organophosphate preparation called Metation aerosol 20 % was tested in 1970—1971 in the control of the caterpillars of larch shoot moth (Zeiraphera diniana Guen.) in the spruce forests of the Ore Mountains, in a dose of 7 l of preparation per 1 hectare. At the same time, a preparation for the control of the caterpillars of green oak leaf roller (Tortrix viridana L.) and the caterpillars of winter moth (Operophtera brumata L.) at a dose of 6 l per hectare was applied. In the north Moravia Metation aerosol 20 % was applied at a dose of 4 and 6 l per hectare to the spruce forests seriously afflicted by caterpillars of the spruce sawfly (Pristiphora abietina Chr.). Although the mortality of the caterpillars of these pests after the application was high (95 % mortality of the caterpillars of the larch shoot moth and the caterpillars of the sprucesawfly and 80 % mortality of the green oak leaf roller caterpillars and winter moth), the preparation could not be recommended for further aerial applications as the treatment by the preparation had adverse effects especially on riverine growths due to its high toxicity to small birds. Therefore, the preparation Metation aerosol 20 % was excluded from the production programme.

In the next years during experiments with aerial applications of preparations against the caterpillars of vapourer moth in south-west Moravia at Velké Meziříčí, and caterpillars of larch shoot moth in the Jizera Mountains and the Giant Mountains, the organophosphate preparations known as Actellic 50 EC (in doses of 0.5 l per 1 hectare) and Fekama 5A AT (in a dose of 4 l per 1 hectare) were used. 100 l of water were used per 1 hectare in each application. Better results were obtained in the application of Actellic 50 EC when the mean mortality of the caterpillars of vapourer moth was 90 % and that of the larch shoot moth 76 %. When using the Fekama 50 AT preparation the mortality of the vapourer moth caterpillars was 84 % and of the larch shoot moth only 70 %.

As the youngest caterpillars of the larch shoot moth (1st and 2nd growth class) are hidden under the caps on budding shoots of spruces it was recommended to add 0.15 l of the pyrethroid preparation ambush 25 EC per 1 hectare to 1 liter of Actellic 50 AC and thus to increase their activity and speed up their contact with chemical spray. After the application of such a combined substance the results were by 10 %—15 % higher in case of the larch shoot moth (85—90 % mortality) than those when applying only Actellic 50 EC.

In 1980—1981 other pyrethroid preparations were tested for the larch shoot moth control besides the above mentioned organophosphate insecticides, such as Cymbush 25 EC at a dose of 0.15 l/hectare and a new preparation known as Evisekt 50 SP at a dose of 1 Kg/hectare. The preparations were applied by the Mi2 helicopter to spruce forests in the west region of the Ore Mountains. 100 l water were applied to 1 hectare. After the evaluation it was found that all preparations applied showed a high effect on the caterpillars of the larch shoot moth. Mortality on the experimental plots treated with pyrethroides Cymbush 25 EC and Decis 2,5 EC was 90 % and on the plot treated with Evisekt 50 SP their population dropped down by 85 to 90 %.

Aerial chemical application of preparations against spruce fly was directed against the imagos of this pest. Good results were achieved only when applying the preparations with DDT and HCH as active substances. When these were forbidden, Actellic 50 EC was used at a dose of 1 liter per hectare.

As the active substance of this insecticide degrades rather quickly in nature and the imagos of the spruce fly are hatched over a longer period of time (2 to 3 weeks) their density dropped only by 40—50 %. Consequently, higher egg production is recorded from the females survining the application with the ensuing medium or even high proliferation of pests. On the basis of this experience it was recommended to perform in 1981 chemical treatment against the caterpillars of the 1st and 2nd growth phases in the plots with high occurrence. On larger plots Actellic 50 EC was used in a dose of 1 l/hectare and in the regions without any danger of contaminating the waters with fish, 0.15 l of Ambush 25 EC/hectare was added. Besides

Cymbush 10 EC in a dose of 0.30 l/hectare, Ripcord 20 EC in a dose of 0.15 l/hectare, carbamate preparation Sevin XLR in a dose of 2 l/hectare, Evisect 50 SP in a dose of 1 kg per hectare and a biotechnical preparation Dimilin 25 WP a dose of 0.30 and 0.40 kg per hectare. The preparations were applied against the youngest caterpillars of spruce fly usually in the first half of July (Tabl. 2).

After the evaluation of the results of chemical treatment the highest efficiency was noted against the caterpillars of spruce fly when applying Evisect 50 SP, as their mortality was higher than 95 % and the average number of dead caterpillars on a downfall sheet of an area of 1 m^2 was 683 individuals. Aslo in the application of this preparation on adult caterpillars of spruce fly (3rd and 4th growth phases) a mortality of 90 % was recorded and the average of 570 dead caterpillars were found on one downfall sheet (max. 917 bodies). Good results were achieved with the biotechnical preparation of Dimilin 25 WP: when applying lower doses (0.30 kg of preparation per hectare) 80 % mortality of caterpillars of the 1st and 2nd growth phases was recorded, and higher doses (0.40 kg per hectare) increased the mortality of caterpillars to 90 %. Toxicity of other insecticides based on organic compounds of phosphorus, pyrethroides and carbamates on the caterpillars of spruce saw fly was considerably lower, as only 9—45 % of individuals died after their application. The caterpillars in the dropping bags were affected by these preparations with prevailing contact effects only insignificantly. Only when using Actellic 50 EC with an addition of Ambush 25 EC, max. 70 % mortality of caterpillars was recorded due to the fumigation ability and irritating effect of this mixture of compounds.

When treating the pine forests invaded by the pine moth (Bupalus piniarius L.) in the East Bohemia in the neighbourhood of the forest plant Vysoké Chvojno several mixtures of Actellic 50 EC plus Ambush 25 EC were tested as for their effects on the caterpillars of this pest (of the 2nd—3rd growth phases), as well as pyrethroid preparations Ripcord 20 EC in a dose of 0.15 l/hectare, Decis 2,5 EC in a dose of 0.15 and 0.20 l/hectare and carbamate preparation Sevin SLR in a dose of 2 l/hectare. The preparations were applied by the AN 2, dosing 100 l of water per 1 hectare. All applied insecticides showed reliable effects on the caterpillars of the pine moth; mortality on all experimental plots was 85—97 %. The highest mortality was reached using these compounds also other pyrethroid preparations were tested on smaller plots (20—100 hectares), such as Decis 2,5 EC in a dose of 0.20 l/hectare, Cymbush 25 EC in a dose of 0.15 l/hectare and the pyrethroid preparations Decis 2,5 EC and Ripcord 20 EC (the mean value being 95 %). One or two hours after the application a great number of spasmodic caterpillars were found having falled down from the tree tops.

Conclusion: When treating the spruce forests against the vapourer moth, larch moth and pine forests against the pine moth, Actellic 50 EC was found to be the best from the group of organic compounds of phosphorus, and Decis 2,5 EC, Cymbush 25 EC and Ripcord EC from pyrethroides. When using Actellic 50 EC the toxicity to the caterpillars of pests was increased by the addition of a smaller amount of Ambush 25 EC (0.15 l/hectare). Evisect 50 SP from the group of nereistoxines with

Table 1
Preparations used for aerial treatment of forests in the CSR against defoliating pests

Preparation		Manufacturer (Country)
Name	Active substance	
Actellic 50 EC	pirimiphos-methyl	Plant Protection Limited, England (Finalized in Spolana CSSR
Fekama 50 AT	butonat	VEB Fettchemie, GDR
Metation-aerosol 20 %	fenitrothion	CHZJD, ČSSR (omitted)
Ambush 25 EC	permethrin	Plant Protection Limited, England
Cymbush 25 EC	cypermethrin	Plant Protection Limited, England
Decis 2,5 EC	dekamethrin	Roussel Uclaf, France
Ripcord 20 EC	cypermethrin	Shell International Petroleum Co., Angl
Sevin XLR 43 %	carbaryl	Union Carbide Corporation, USA
Dimilin 25 DP	diflubenzuron	Philips-Duphar B. V., Netherlands
Evisekt S 50 SP	thiocyklamhydrogenoxalat	Sandoz A. G., Switzerland

Table 2
Effects of the preparations used for aerial application to forests against defoliating pests

Preparation	Dose kg/hect.	Average effects on caterpillars in %			
		Larch shoot moth (Zeiraphera diniana)	Pine moth (Bupalus piniarius)	Spruce fly (Cephalcia abietis)	Vapourer moth (Orgyia antiqua)
Actellic 50 EC	0,50	—	—	—	90
	1,00	78	82	45	—
Actellic 50 EC + Ambusch 25 EC	1,00 + 0,15	88	92	67	—
Fekama 50 AT	4,00	70	—	—	84
Cymbush 25 EC	0,15	90	—	16	—
Decis 2,5 EC	0,15	92	94	14	—
	0,20	—	97	19	—
Ripcord 20 EC	0,15	—	94	11	—
Sevin XLR	2,00	—	84	9	—
Dimilin 25 DP	0,35	—	—	80	—
	0,40	—	—	90	—
Evisekt S 50 SP	1,00	88	—	96	—

Note: Preparation was not used

contact effects and partially systemic effects was found to have high effects on the caterpillars of the larch shoot moth.

When protecting the spruce growths against the invasion of spruce saw flies chemical treatment against the coungest caterpillars of the 1st and 2nd growth phases must be performed. The highest mortality (over 90 %) resulted from the application of Evisect 50 SP (1 kg/hectare) and the biotechnological preparation Dimilin 25 WP (0.40 kg/hectare). After the treatment by these preparations no significant mortality of useful insect species was observed. Only sporadical mortality of the flies from the Ichneumonidae familly was observed and their population density was not significantly reduced.

Application of Pyrethroid preparations Ripcord 20 EC, Decis 2,5 EC, Cymbush 25 EC and carbamate preparation Sevin XLR on the caterpillars of the spruce saw fly showed little efficiency as the mortality of caterpillars did not exceed 20 %. These contact insecticides affected only a low number of caterpillars in the dropping bags.

To conclude, one can state that the preparations which were tested and recommended for the aerial treatment of forests against defoliating pests are not toxic for warm-blooded animals and do not show any cumulative properties. Majority of the compounds tested were sufficiently active in case of the proliferation of pests and, therefore, these preparations can substitute for those on the basis of chlorinated carbohydrates emploved in the past for aerial treatment.

CSO: 2020/59

CZECHOSLOVAKIA

PRODUCTION, QUALITY IMPROVEMENT OF CHEMICAL FERTILIZERS

Bratislava CHEMICAL REVIEW in English Apr 82 pp 2-8

[Article by Ing. Jan Palka, CSc., Ing. Anton Jantula, Ing. Juraj Synak, CSc.]

[Text]

Nutrition of the population is a serious problem standing in the focus of attention of the world-wide organizations (UNO) and countries (the 4th Plenum of the Communist Party of the CSSR). Methods are sought for increasing the food production, particularly through plant production intensification. All over the world, the loss of agricultural land and population growth — two contradictory factors — are recorded.

The role of agriculture — according to Viljams — consists in the transformation of kinetic (solar) energy into potential energy, i. e. food for people.

Which factors are participating in the fulfilment of this role and what are their respective shares? Soil, climatic conditions, soil cultivation, fertilizers, plant protection and used varieties. The share of the above factors has changed in the CSSR over a period of 25 years (1948—1973) as follows:

Table 1

Factor	1948	1973
Soil	40 %	10 %
Climatic influences	20 %	15 %
Soil cultivation	20 %	10 %
Fertilizers	10 %	30 %
Plant protection	5 %	15 %
Variety	5 %	20 %

The first two factors of Table 1 are determined by the nature. The remaining ones are affected by man. Three of these are affected directly by workers of agricultural plants, fertilizers and plant protection are determined by chemical works and thus, the farmer controls only the application of chemical products. The last factor is affected especially by workers of breeding stations. New varietes give better yield, they can better utilize the nutrients from industrial fertilizers; however, they are more sensitive to plant pests.

The shift from the predominant influence of the first three factors (from 80 % in 1948 to 35 % in 1973) to that of chemization (fertilizers and plant protection) and breeding efforts (20 % in 1948, 65 % in 1973) indicate the importance of fertilizers. Consumption of fertilizers does not rise only in the CSSR but all over the world. This is evident from the survey of the consumption of fertilizers in the world during the last thirty years.

Table 2

Continent	1950	1960	1970	1980
Europe (including the USSR)	7.6	15.5	34.8	52.5
North America	4.3	7.5	15.7	22.4
Latin America	0.3	0.9	2.9	6.5
Africa	0.3	0.7	1.6	2.9
Asia	1.0	3.9	11.6	24.4
Oceania	0.4	0.9	1.4	2.0
Total	13.9	29.4	68.0	110.7

The consumption of fertilizers in the world doubled over a period of 10 years. The highest growth rate moves, however, from industrialized countries to socialist countries.

Powder, Granulated and Liquid Fertilizers

The production of industrial fertilizers has a relatively short history. During the development the form of fertilizer was changing from powder one (superphosphates, nitrogen lime, ammonium sulphate, potassium salt) into granulated fertilizers, and from granulated to liquid ones. Granulated form of fertilizers has several advantages: their handling is easier and their distribution on the soil surface is more even. Granulated fertilizers can be packed in bags which enables more exact dosing. The development of granulated fortilizers aimed at:

- reduction of the granulometric spectrum
- mixability with other types of fertilizers with granules of the same size
- protection of fertilizers against sintering
- change from packed fertilizers to loose fertilizers

Liquid fertilizers are fertilizers of a new generation. The liquid form offers other advantages unknown in case of the solid ones:

- practically ideal distribution of nutrients over the soil surface
- perfect mechanization of hangling along the whole flow from the manufacturer to the field application

- incerase of nutrient availability for plants
- introduction of a rational method of fertilization of separated and foliar nutrition.

What can the Slovchémia Trust offer to the agriculture First of all, several figures

Table 3

Index	1960	1965	1970	1975	1980
Production in thousands tons of pure nutrients	46	150	295	530	637
Share of p. n. supplies by Slovchémia in CSSR	9	28	32	37	54
Average concentr. Slovchémia	20	23	27	33	42
CSSR	20	24	24	29	35
Share of granulated fertil. Slovchémia	—	38	49	58	79
CSSR	38	33	50	61	70
Share of multicomponent fertil. Slovchémia	0	0	31	52	54
CSSR	4	2	23	39	44
Share of liquid fertilizers Slovchémia	—	—	—	8	10
CSSR	2	1	0.8	5	6

Survey of the Slovchémia Trust products

Nitrogen fertilizers

Type	Ammonium sulphate	Saltpeter LAD 27.5	Urea fert.
Parameter			
Form	white crystals	grey granules	white granules
Nitrogen content	21	27.5	46
For 100 kg of N	476 kg	364 kg	217 kg

Multicomponent fertilizers

Type	Demetra	GVH-5	NPK-NF

Parameter			
Form	grey granules	greyish brown granules	greyish white granules
Pure nutriets in %	37.6	43.5	48.0
Of it N	11.2	8.5	16.0
P_2O_5	11.2	17.5	16.0
K_2O	15.2	17.5	16.0
Quantity per 100 kg of p. n.	270 kg	230 kg	208 kg

Liquid fertilizers

Type	DAM-390	Fostim
Parameter		
Colour	colourless, clear liquid	colourless, green to black-brown (according to H_3PO_4)
pH	6.0—7.5	6—7
Weight t 1	1.3 kg	1.285 kg
N in % by weight	30	8
P_2O_5 in % by weight	—	24
Pure nutrients in % — total	30	32
Nutrients in kg per 100 l	39	41
Corrosive properties	corrodes steel	does not corrode metals

What were and what are the aims of the Slovchémia Trust in the development of the production of industrial fertilizers?

Granulated fertilizers

During the development of industrial fertilizers one should bear in mind that the chemization of agriculture must not an objective per se but on the contrary, its role (according to Harmaniak) is to help to raise the yields and productivity of labour.

The effort to manufacture fertilizers with maximum of available nutrients and good properties is based on this objective. Technological properties of fertilizers are those which influence their transportation, storing and distribution, i. e. they affect the post-production operations.

Important technological properties of granulated fertilizers: — looseness — form of handling — nutrient concentration.

Looseness is an exceptionally important technological property of granulated fertilizers. Therefore, the attempts at its improvement occupy a prominent position in the Slovchémia Trust programme. The loose form is achieved by technological methods as well as by an improvement of the production conditions and surface treatment of final ready granulated fertilizers by preparations preventing their sintering. Opinions on the loose form vary in connection with another technological property — form of handling. Imperfect and unstable loose form impairs the granulometry and thus also the evenness of distribution. It requires one additional operation and does not allow handling bulk fertilizers.

The fact whether the fertilizer is packed or not is expressed in the term *"handling form"*. The programme of agrochemical plants, the programme of cooperation and specialization of agricultural production requires mechanization of work. For this purpose fertilizers in bulk are the best. Of course, fertilizers in bulk in an agricultural plant without concenient equipment (store, transportation, etc.) cause only difficulties. Advantages of handling the fertilizers in bulk can be used only if the plant is properly equipped (stores, mechanization equipment and organization of work).

Fertillizers in bulk make the work easier, reduce the number of workers and save the costs of the manufacturer (for packing and filling) and the user. Already in 1978 the farmers submitted a requirement for 90 % of bulk fertilizers in 1990. Slovchémia creates all prerequisites to meet this demand in advance. It is necessary to develop an efficient surface treatment of fertilizers and to transport them in convenient wagons. For the moment, urea from Duslo Šaľa can be transported in bulk (the experiment with storing ended in March 1981 in Horné Ozorovce) as well as GVH from the Chemical Works of J. Dimitrov, Bratislava (the experiment with storing ended in September 1981 in the Agrochemical Plant in Velké Meziříčí). Other fertilizers will follow. Unfortunately, the situation in the construction of agrochemical plants does not allow to fully employ the possibilities offered by Slovchémia.

Table 4
Economic effect of bulk fertilizers in agriculture

Costs	Fertilizer packed	Fertilizer in bulk
Manufacturer's (except from the costs for production)	100 %	43.4 %
Transportation	100 %	100 %
Agricul. plant	100 %	97 %
Total	100 %	76.6 %

Concentration of nutrients in industrial fertilizers can directly influence the absolute value of their material flow. Increasing the concentration of nutrients by 1 % at the present amount of about 6 mil. tons of fertilizers per year would enable to increase the annual transport by 60.000 tons of nutrients, or to save the transportation of about 220,000 tons of material which will be reflected not only in the transportation costs but also in energy saving.

Liquid fertilizers

Liquid form was in fact the first form of industrial fertilizers. In 1840 Liebig suggested to dissolve bones in sulphuric acid and to apply this solution to soil prior to ploughing. Since that time the application of liquid fertilizers occurred sporadically, especially of ammonia water and later, of anhydrous ammonia which continues to be frequently used in some countries.

Anhydrous ammonia is the most concentrated industrial fertilizer in general (it contains more than 82 % by weight of N). Its disadvantage is, however, that it must be stored under pressure (0.8 MPa) and must be applied under the soil surface. It is bound without losses in humid and active soils. Its application requires a complete distribution system for ammonia handling, i. e. transportation equipment (in case of greater consumption transportation by pipes is recommended), storing capacities (pressure tanks), applicators (pressure vessels). In the plants without this rather costly equipment pressureless liquid fertilizers are applied more extensively.

Pressureless liquid fertilizers

This type of liquid fertilizers is represented by the aqueous solution of ammonium nitrogen and urea (DAM-390) which has not increased vapour tension and thus, handling without hermetic sealing of vessels and without over-pressure is possible. It can be transported in pressureless tanks, stored in pressureless reservoirs and applied directly to the surface or even directly on leaves. It contains 28—32 % of N, which is about 2.7 times lower than that of anhydrous ammonia, but the same or higher than that of ammonia saltpeter with limestone (27.5 % N). The rapid development of pressureless liquid fertilizers was possible just due to these properties (DAM-390 and KVH, i. e. liquid multicomponent fertilizers).

Research and development of liquid fertilizers started in Slovchémia ten years ago. In the first years a nitrogen solution of DAM-390 was prepared in Duslo Šaľa. The application of this solution was successful and aroused a great interest. The idea of liquid fertilizers gained ground and in the middle of the last five-year plan in was incorporated into the programme of agriculture. Consumption was increasing and in 1980 it reached 4.7 % of nitrogen and 0.9 % of phosphorus from the total volume of nutrients used in the form of industrial fertilizers. Slovchémia occupies the first place in the production of liquid fertilizers: in 1980 68 % of liquid fertilizers of the production of the CSSR were manufactured by the works of Slovchémia.

Advantages of liquid fertilizers

Liquid fertilizers have better technological properties than granulated ones, as they are "perfectly loose", do not sinter and handling does not require packages. Thus, they enable maximum mechanization of all works connected with transportation, storing and aplication. They save physical work and ensure high culture of labour and hygiene. Liquid fertilizers do not produce dust neither during transportation nor aplication. Their application results in the most even distribution of nutrients on the soil surface achieved so far which is impossible in case of granulated fertilizers.

Concentrations of nutrients is maintained at the level of granulated fertilizers (30, 32—44 % of suspension as much as 50 %). The year round storing is possible without any negative effects on the fertilizer quality. Crystallization temperatures are below −10 °C. If the fertilizer is cooled below this temperature and the salts crystallize out, it resumes its liquid state when heated above the temperature of crystallization.

The progressive quality of liquid fertilizers consists particularly in the fact that they do not only enable but also require a complete mechanization of all operations with the fertilizer and eliminate the physical work which is unpleasant and aven hazardous to health in case of solid fertilizers. Reduced physical strain brings about cost savings and mechanization increases the productivity of labour. Results of our biological research in agricultural plants are remarkable:

a. direct cost savings
b. live work saving
c. savings of mechanical work.

In selected agricultural plants with an increased representation of liquid fertilizers the following parameters were achieved during the year-round application:

Table 7

Parameter	Solid fertilizer packed	Solid fertilizer in bulk	Liquid fertilizer
Direct handling costs	—	100 %	50—41 %
	100 %	—	17.6 %
Live work requirements	(100 %)	(34—50 %)	(15 %)
	4.2 h/t	1.1—1.4 h/t	0.63—0.65 h/t
Mechanical work requirements	2.6 h/t	1.17 h/t	0.65 h/t
	(100 %)	(45 %)	(25 %)

The saving of mechanized work resulting in reduced energy consumption is of special interest.

Agrochemical efficiency of liquid fertilizers is given especially by the possibility of better optimization of the plant nutrition. With respect to the basic nutrition — in comparison with solid fertilizer distribution — considerably higher evenness of nutrient distribution is achieved. This results in a significant yield increase. When comparing 164 cases, the mean value of weighed averages of yields of individual crops is higher by 6.4 % in liquid fertilizers (nitrogen). Liquid fertilizers offer a broad spectrum as for the divided and foliage nutrition of plants. The intake of nutrients by foliage enables their prompt incorporation into the circulation of nutrients in plants-without mediating role of the soil-eliminating thus this uncontrollable factor which beyond our influence. This is evident from the data on nutrient utilization by grass growths during a period of 4 years:

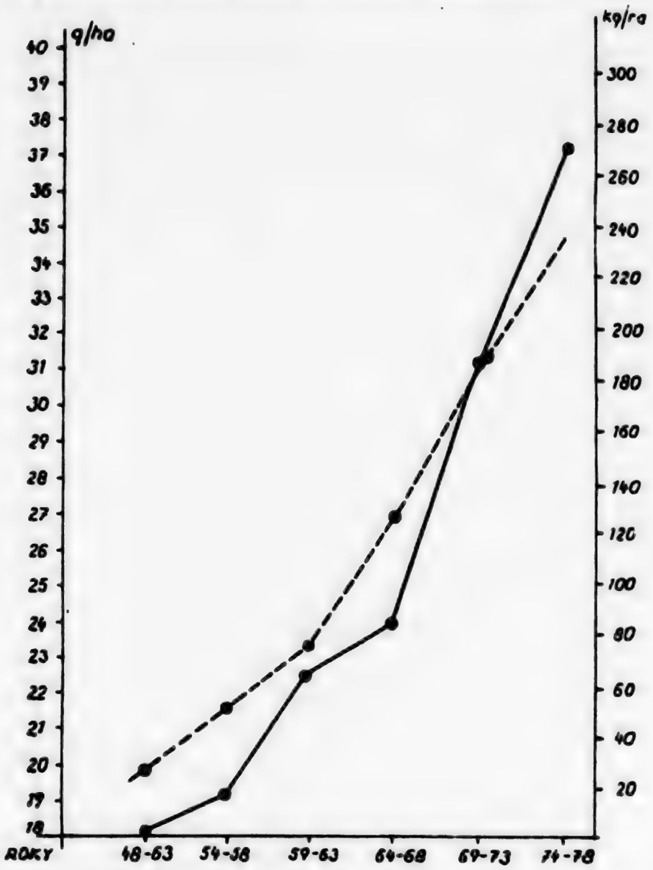
Nutrition	LAV-27	DAM-390	%
Single	129.2	136.8	105.9
Divided	135.7	155.9	114.9

Conclusions of research studies of the Czechoslovak biologists prove unambiguously that a purposeful application of liquid fertilizers highly exceeds the purposeful application of solid fertilizers.

Other advantages of liquid fertilizers

Liquid fertilizers can be applied together with chemical plant protection agents against weeds, diseases and pests. In the USA where the application of liquid fertilizers is the most extensive, as much as 60 % of their volume is combined with pesticides in the works with an intensive utilization of liquid fertilizers.

Dependence of cereal yields on nutrient consumption



——— yields of cereals in q/ha
---------- NPK in kg of pure nutrients per hectare
(1 kg of NPK in p. n. = 7 kg of cereals)

In the conditions of the CSSR, the simultaneous application of liquid fertilizers (DAM-390) and post-emergent herbicides resulted also in an improved weed eradication effect besides the savings of operations in the field; it enables to reduce the doses by as much as 20 %. When considering the pre-harvest chemical drying of crops which is necessary with respect to the mechanical harvesting by joint application of desiccants with DAM-390, as much as 50 % of desiccant is saved.

Liquid form and foliar additional fertilization are recommended as the most rational method for the introduction of trace elements into soil. Intensive crops eliminate from soil not only macronutrients (N, P, K) but also micronutrients and trace elements. Their shortage limits further increases in yields entailing the yield depression of incidence of various diseases (chlorosis, etc.). It seems that the liquid fertilizers can be important economic carriers of the trace elements. The first experiments, thus far only at a research basis, are very promising. Fertilizers in general are the source of environmental pollution, especially of waters — underground waters by seepages polluted with inorganic salts — nitrates and nitrites, and surface waters by washing off the arable land saturated with industrial fertilizers. Also in this case the liquid fertilizers play a positive role as, because of a very even distribution — they employ to maximum their ability to be bound to the soil complex and prevent thus an excessive pollution of underground waters. In case of surface washing off, the danger of surface water pollution decreases with the application of divided and foliar plant nutrition. Foliar fertilization of the vegetative growth with a high retention of nutrients in the plant inself takes an important share in the application of liquid fertilizers. At the same time, this is an efficient measure against the erosive washing off of nutrients. This is impossible in solid fertilizers which can reach the plants only through the root system.

What does Slovchémia prepare in the field of liquid fertilizers

Current assortment: nitrogen liquid fertilizer DAM-390 and multicomponent liquid fertilizer of orthophosphate type — Fostim — with a content of nutrients being 8—24—0; this assortment will be enriched by a liquid multicomponent fertilizer of polyphosphate type KVH-PF with a content of pure nutrients being 10—34—0 which is scheduled for the production by the end of the Seventh Five-Year Plan. In the future it will become the main type of the liquid multicomponent fertilizer manufactured by the Slovchémia Trust. Advantages of the multicomponent liquid fertilizer — higher concentration (+12 % of pure nutrients), polyform of P_2O_5 and resulting sequestering ability of the fertilizer as well as the ability to transform the trace elements in soil into the assimilable form, lower retrogradability of P_2O_5 due to which losses of phosphorus are reduced and stable suspensions are easier generated — especially carrier suspensions of the potassium component.

Slovchémia prepares the production of liquid concentrates of trace elements which will be added into liquid fertilizers, especially into the DAM-390 liquid fertilizer. In this way, the trace elements will be applied to that plot where they are required, and in such amounts or combinations as determined by the agronomist according to chemical analyses of soil and plants. Responsibility for dosing the trace elements is thus transfered from the chemical plant to the agricultural one.

In 1980 Chempik Litvínov, design and engineering organization, elaborated a study on the distribution of liquid fertilizers by product pipelines. The project is under examination and the way and possibility of its implementation are looked for. Its employement would result in a considerable reduction of the railway load and supply to all areas would be more flexible.

Industrial fertilizers have become the strongest intensification factor of the plant production. This factor has enabled to increase the yields in the CSSR during the thirty years of the socialist agriculture from 1.8 tons/hectare in 1948—1953 to 3.7 tons/hectare in 1974—1978. When observing the growth in the quantity of industrial fertilizers and the increase in the yields we can see that since the period of 1969—1973 the yield growth rate exceeded that of fertilizers (see Fig. "The dependence of cereal yields on fertilizer consumption").

Production of food is at present of the same importance for a country as its defence ability. There is a great number of agricultural and chemical industry workers participating in the food production. Slovchémia takes a substantial share in the food production in the CSSR with its supplies of industrial fertilizers.

Developmental trends in the production of fertilizers within the Slovchémia Trust can be summarized as follows:
Granulated fertilizers manufactured in the existing capacities should be maintained at the present level of production at the continuous growth of their guality (e. g. classification of further products into the 1st grade of quality) by improving especially their physico-mechanical properties and to make preparations for shipments in bulk ahead of the agricultural sector.

The principal form of industrial fertilizers in the future is the liquid one. Therefore, it is necessary to expand the production of nutrients only in the form of liquid fertilizers and majority of nutrients should be manufactured in liquid form in 1990—2000. It is necessary to focus on the improvement of the quality of liquid fertilizers, increase of concentration and production of completing assortment of liquid fertilizers — concentrates of trace elements and other additives using the perspective liquid form.

CSO: 2020/53

PERSPECTIVE OF LIQUID FERTILIZERS

Bratislava CHEMICAL REVIEW in English Apr 82 pp 9-12

[Article by Ing. Miroslav Kalina, CSc.]

[Text]

Industrial fertilizers are indispensable for the intensification of agricultural production. During thirty years of the socialist agriculture in the CSSR their consumption increased almost 14 times due mainly to the Czechoslovak chemical industry, and in 1980 reached about 250 kg of pure nutrients of nitrogen, phosphorus and potassium per 1 hectare of agricultural land.

This level of fertilization ranges the CSSR among the leading countries of the world.

In 1985 a consumption of 275—280 kg of pure nutrients per hectare of agricultural land is expected to be reached in the CSSR. By 1985 industrial fertilizers will be supplied chiefly in a solid form. Certain amount of fertilizers corresponding approximately to the increase in consumption during the forthcoming period will be supplied in the form of liquid fertilizers. In 1985 the supplies of liquid fertilizers in the CSR should be 11.5 % N and 8.3 % P_2O_5 and those in 1990 are expected to amount to about 20 % N and 15 % P_2O_5.

Liquid fertilizers represent the perspective tendency in the nutrition of plants and fertilization. Therefore, their production and consumption in agriculturally developed countries is continuously increasing. Advantages of liquid fertilizers are evident particularly under the conditions of socialist agricultural large-scale production. The efficiency of liquid fertilizers is equal to that of solid fertilizers. Their main contribution consists, however, in the elimination of hard physical work at handling, uniform incorporation of nutrients into the soil as well as high degree of hygiene and culture of work during the whole process of fertilization.

In the next period liquid fetilizers should play an important role in ensuring the rational system of plant nutrition.

Liquid fetilizers are classified according to the contet of nutrients, physiological effectiveness, corrosive properties, volatility and ammonia content. The best criteria for their classification are ammonia pressure, nutrient concentration and degree of corrosiveness as these properties have the greatest effect on post-production costs. According to the pressure of free ammonia the classification is as follows:

High-pressure liquid fertilizers

This group includes anhydrous ammonia. Although it has been employed in the Czechoslovak agriculture since 1957 its application has not been expanded because of difficulties with transportation and application equipment and demanding safety measures.

Medium and low-pressure liquid fertilizers

This group involves ammoniates (ammonised solutions of ammonium nitrate, urea or their mixtures) which are not used in our agriculture because of their unsuitable properties (strong corrosiveness and necessity of pressure vessels in the post-production operations). Then, the group includes ammonia liquor which is of local importance only.

Pressureless solutions of liquid fertilizers

These are perspective types of liquid fertilizers and their chief representative is the liquid fertilizer DAM-390 manufactured since 1973 in Duslo Šaľa, Natl. Corp. Other manufacturers are Chemopetrol, Concern Enterprise of the North Bohemia Chemical Works Lovosice and East Bohemian Chemical Works Pardubice, Moravian Chemical Works Ostrava and Chemko Strážske.

DAM 390 is an aqueous solution of ammonium nitrate and urea containing in average 30 % of nitrogen of which 7.5 % of saltpeter origin, 7.5 % of ammonia origin and 15 % of amide nitrogen. Its specific weight is 1,300 kg/m^3 which means that 1 m^3 of fertilizers contains 390 kg of nitrogen.

The hitherto foreign and Czechoslovak research studies show that DAM 390 is equivalent to solid nitrogen fertilizers when considering its agrochemical efficiency. The liquid form, however, brings about a number of advantages particularly in the sphere of handling. In fact DAM 390 can be used for basic fertilization, additional fertilization during vegetation, for speeding up decomposition of post-harvest residues, in desiccation of same crops it can replace part of desiccants; it can be used as the nitrogen component for mixing nitrogen-phosphorus or nitrogen-phosphorus-potassium fertilizers as well.

This group includes also the series of single and double component fertilizers, six types of which are manufactured in Chemopetrol, The North Bohemian Chemical Works in Lovosice. The individual types contain nitrogen, phosphorus, pottasium (chloride-free form), calcium and magnesium. The EMPEKASOL series involves:

1. NP-salt containing nitrogen and phosphorus, consisting of ammonium dihydrogen- and hydrogenphosphates.
2. PK-salt containing phosphorus and potassium and consisting of potassium dihydrogen- and hydrogenphosphates.
3. SK-salt containing potassium and sulphur, and consisting of potassium thiosulphate.
4. CK-salt containing potassium and consisting of potassium carbonate.
5. CaN-salt containing nitrogen and calcium and consisting of calcium nitrate.
6. MgN-salt containing nitrogen and magnesium, consisting of magnesium nitrate.

Series of the above liquid fertilizers enables a scientifically controlled plant nutrition with basic nutrients in dependence on their immediate requirements at any ratio according to the inorganic analyses of plants. It is used for additional fertilization of decorative plants and vegetables in greenhouses, grape-vine as well as of some field crops. More detailed data on the properties of these liquid fertilizers are in Table 1.

The group of pressureless liquid fertilizers includes also multicomponent fertilizers with a balanced ratio of nitrogen, phosphorus and potassium, containing also trace elements, eventually magnesium and growth stimulators. These are, e. g. Floran, Harmavit, Lafolany, MKH-18 and Vegaflor: these fertilizers are used for leaf fertilization of different, particularly garden crops and cultures, then for fertilization watering in greenhouses, etc. They are available at retail for private growers.

Pressureless suspension liquid fertilizers

This is a suspension of fine crystals of nutritive salts in their saturated solution, which have a tendency to sediment. These include particularly NP fertilizers of the type 8—24—0 prepared from extraction phosphoric acid. Presently, they are supplied in limited amounts from small production lines installed in Fosfa Poštorná, Natl. Corp. and Chemical Works of J. Dimitrov, Natl. Corp. Bratislava (under the trade mark of Fostim); pilot plant production is being prepared in Chemopetrol, North Bohemian Chemical Works in Lovosice (PENSOL) and

Table 1
Series of the ENPEKASOL liquid fertilizers

Fertilizer	Nutrients g/l min.	Weight kg.m^{-3}	Crystallization temperature (°C)
NP-salt	91 N 288 P	1250	− 8
PK-salt	284 P_2O_5 340 K_2O	1480	−21
SK-salt	340 K_2O 237 S	1480	−20
CK-salt	342 K_2O	1380	−28
CaN-salt	120 N 225 CaO	1500	−18
MgN-salt	104 N 133 MgO	1370	−10

a small-scale production is being prepared in the East Bohemian Chemical Works in Pardubice (SYNSOL). Their production depends on the availability of the basic product — phosphoric acid.

NP fertilizers of the type 8—24—0 contain 100 g of N and 300 g of P_2O_5 per liter and are applied either separately or in a mixture with DAM 390 for basic fertilization as well as additional fertilization of different crops during vegetation, particularly in soils with good reserves of potassium and in the systems of reserve fertilization with solid potassium.

In the last years Chemopetrol, Concern Organization Research Institute of Inorganic Chemistry, Ústí nad Labem, paid attention to the preparation of concentrated basic NP suspensions 10—30—0 and 11—33—0 which should replace NP 8—24—0.

This group includes also the nitrogen-calcium suspension known as CANSOL S which has been manufactured by Chemopetrol in the North Bohemian Chemical Works, Lovosice for several years. This solution of calcium nitrate contains min. 8 % of nitrogen and 15 % of calcium (as CaO). CANSOL S is used mostly for fertilization on leaves of various plants grown especially in acid soils.

Introduction of liquid fertilizers into agriculture depends on their manufacture, transportation, storing and application.

As for the manufacture in the CSSR the main problems consist in the lack of raw materials, especially of phosphoric acid, as well as in storing and shipment of final products.

The problems of transportation arise in the supply of raw materials (urea and phosphoric acid) as well as in the shipment of final products. The production and shipment of the series of the ENPEKASOL liquid fertilizers present practically no problems as these are transported mostly in polyethylene containers with a capacity of 600 liters using the customers' means of transport. Also CANSOL S is tranported chiefly by the customers' means of transport. Expansion of the CANSOL S production is limited as in the case of DAM 390 and PENSOL 8-24-0 by sufficient quantities of railway tanks and their prompt return.

The current storing capacity is concentrated chiefly in agrochemical plants and amounts to 32,000 m^3 in the CSR, the largest volume (over 40 %) being in the South-Moravian Region where the development of liquid fertilizer application is ahead. This is followed by the Middle Bohemian Region with almost 20 %, and the least extent of construction is in the West and North Bohemian Regions. The actual storing capacity is somewhat higher, as a number of agricultural plants employ for the liquid fertilizer storing different provisional arrangements (e. g. discarded railway cisterns, fuel tanks, etc.).

The problems of application equipment in the agricultural and particularly in the agrochemical plants are managed satisfactorily. They use car sprinklers Kertitox Global from Hungary and self-moving applicator PAG-7 with the KONAG trailer. This transport and application line with a high capacity is manufactured by Agropodnik Gottwaldov. Airplanes and various adaptations of sprinklers including Kertitox 28/18 installed in the IFA car are also employed.

Finally one can state that the chief problem in the introduction of liquid fertilizers to agriculture consists in the transportation which has negative effects on the production, too (lack of raw materials, restriction of production when the stores of the manufacturer are full); it must be solved together with the Czechoslovak railways and the sector of agriculture. All the existing theoretical konwledge and practical experience justify the gradual increase in the share of liquid fertilizers which are economically advantageous from the aspects of society as a whole.

CSO: 2020/54

RESEARCH, PRODUCTION OF BLOOD PREPARATIONS

Budapest MAGYAR TUDOMANY in Hungarian No 6, Jun 82 pp 467-468

[Text] The program proposals of the National Intermediate-Range Research and Development Plan (OKKFT-Orszagos Kozeptavu Kutatasi es Fejlesztesi Terv) were discussed by the presidium of the academy during its February session.

The Ministry of Health and the academy were entrusted with the task of developing a program to produce diagnostic and therapeutic blood products, that is, to initiate a nationally coordinated research and development activity toward this goal. In the health services and in most branches of medical science, there is an increasing demand for such products throughout the world. Starting to manufacture these products can alleviate nationwide scarcities already during the sixth 5-year plan period and, in addition to considerable savings on imports, it may also yield capitalist exports. The program is designed to involve domestic basic institutes which are already supplying part of the medical-biological products to the nation and which have the basic requirements for research in improved production methods.

Within three subprograms, the program includes 11 research-developmental goals. Among them, the nine goals of the first subprogram have the collective title: "Therapeutic and Diagnostic Blood Products". The second subprogram deals with liposome products, the third with radioactive products, their development and introduction into the health services. The original proposal stresses the openness of the plan; it can be joined at any time by any institution with research and development or product manufacturing activity. One of its goals is precisely to set up coordinated cooperation in the chain of innovations aimed at producing medical-biological products to remedy the basic national scarcities.

The proposal contains detailed specifications for the main events in the subprograms, also including research, developmental and practical-manufacturing projects. Subsequently, it lists the products (ex. therapeutic plasma proteins, aspecific lymphocyte products, radioactive compounds, etc) which can be expected to be produced within the subsequent 5-year plan.

According to the program, considerable achievements can be expected from fulfilling every single subprogram. Thus, among others, we can count on the production of specific immunoglobulin products and purified leukocyte interferon; the production of transferrin and lactoferrin, and their clinical application; the production of calmodulin from unused blood preparations; the production of hemosome preparations and their use as blood substitutes; the expansion of new in vitro radioimmune assay kits and in vivo diagnostic aids, etc.

Using currently available research and development funds, numerous researchers have been working for a long time in areas belonging to the recommended topics and, based on their training in various specialties, are prepared to perform the research and development as well as the production tasks.

Personnel data on the current production of blood products and other biological products according to the place of research, the number of collaborators having scientific qualifcation and the tools available, and the sources of income to cover operational costs are presented in a separate table. It was also studied how much of the operational costs--according to subprograms--were accepted by the individual institutions, and investments of what order of magnitude are planned by them to obtain the necessary instruments. Part of the instrument and machine purchases require foreign currency; also, new buildings are needed to house animals, preparatory work, storage and refrigeration. The planned functions are an indispensable condition for the fulfillment of every program. Only a minimal personnel increase is required in the research establishments to fulfill the program.

In addition to the preparatory activity which has already been established or which can be established in the research and development facilities, the large pharmaceutical houses such as the United Pharmaceutical and Nutrient Works, the Pharmaceutical Works of Kobanya, the HUMAN and the REANAL will also be in a position to receive and apply the results. The investments needed as a prerequisite for industrial application will be realized in part during the sixth and in part during the seventh 5-year plan period.

According to the proposal, the minister of health would be responsible for carrying out the program. The proposal recommended the establishment of an interportfolio Program Council--according to the guidance principles of OKKFT (National Central Research and Development Council) for the actual guidance--important decisions, supervision of the subprograms and the eventual regrouping of workforces. The council would be supported by a program office for operative guidance. Institutions which have a fundamental role in the accomplishment of the individual subprograms, or where the expertise needed for the topic is available and the previous production method is the most suitable, would be responsible for the individual subprograms.

The rentability of production costs for the preparations planned in the program can only be estimated at this time but it is a positive factor that the "basic material" is secured, expertise gained over many years is already available. Based on a relatively extensive instrument and machine pool and, finally, on excellent international connections, transfer to and domestic acceptance of the most modern methods can be ensured.

The interdisciplinary program involving several portfolios has the goal to establish the scientific basis and high technical standards for the most modern utilization of blood, referred to globally as "red gold". Domestic use of the products--and thereby considerable import savings--will be handled by the health system, and Medimpex will take care of their export.

At the start of the presidial discussion, those submitting propositions reported on the work of the ad hoc committee preparing them. The version judged optimal and presented here was chosen from the three recommendations submitted.

There were 18 comments from invited experts and from members of the presidium. There was agreement that the program is valuable, was prepared by well-founded work, and support for its acceptance was recommended by most speakers.

Some questioned the proportions of the program criticizing the unequal quotas allocated to the subprograms. Many called attention to the importance of international comparison to avoid unnecessary duplications (ex. Czech and Soviet researchers are also studying the expansion of radioactive preparations; in the United States and in Western Europe, they are already using diagnostic tools which we are only planning to do research on).

Some commentators recommended stressing blood plasma and interferon research, viewing interferon production as attractive also in the international context. Others stressed the importance of complexity and the large-scale change in pharmaceutical production expressed by this program insofar as it would also make possible to modernize domestic diagnostic procedures and tools. Some mentioned the possibility of long-range, indirect results, and some formulated the economic issue, the need for market oriented forecasting. Another function of the program was also mentioned which had as its goal the correction of deformities in domestic research, a laudable goal. By realizing the program, for instance, it would become possible to expand more modern pregnancy screening testing. In this field, our backwardness is regrettably great compared to many countries. Currently, 45 irreversibly damaged children are born annually in our country. This could be avoided with the help of radioactive preparations.

A debate developed concerning the appropriateness of expenditures required for the program. Some thought it might be more useful to spend some of the money on starting domestic insulin production. Finally, during the debate, it was declared--as a matter of principle--that health care, and thereby also providing insulin to diabetics, is within the sphere of satisfying basic human necessities, and the possibilities of solving the problem of domestic production of insulin must also be dealt with although this cannot be the task of this particular program.

Contradictory opinions were voiced concerning the extent to which the presidium of the academy can be considered a competent body to decide such totally specialized problems. The opinion appeared most acceptable (and this was also expressed in the presidial summary) that the presidium of the academy is an authentic body with respect to judging scientific up-to-dateness. Currently, the business aspects of the medical biology program do not fall within the sphere of the presidium. But this body--particularly in cooperation with invited specialists--is responsible to decide the question whether the program contributes to raising the level of domestic medical care.

The presidial resolution stated that the presidium of the academy considers the program suited for a more modern domestic health supply, for raising the level of our scientific attitude and our methodological culture. And also, achievement of the program would become the organizational force in the health services, for instance, the expansion of screening tests.

The presidium recommended correction of the draft at some points and a more detailed elaboration of the financial plans by their authors. Finally, it recommended acceptance of the program by the Committee on Science Policy.

2473
CSO: 2502/90

SELF-SUSTAINING FUND APPROVED FOR COMPUTER TECHNOLOGY APPLICATIONS

Budapest MAGYAR HIRLAP in Hungarian 28 Jul 82 p 7

[Article by Katalin Szikora: "Self-Sustaining Fund; Money for Computer Technology--Obtainable Through Competition"]

[Text] The Central Statistics Office has the state administrative task of central guidance of the applications of computer technology and, as a condition for this, to create good-quality programs. The computer-technology-applications development fund offers an opportunity for this.

The fund was created because there was not a central source of money to carry out these tasks. But the demand was becoming ever more urgent and ever more massive--to provide a sufficient quantity of good-quality operating, applications programs to use on the computers already embracing every area of life. It was also important that the programs not be the results of the individual developmental desires and knowledge of the users, because then their uniform national expansion and further development would have become impossible.

Sober Goals

On the basis of a 1977 resolution of the State Plan Committee the Central Statistics Office--with the support of the interested main authorities--established the computer-technology-applications development fund to finance the central applications development activity for ESZR [Uniform Computer Technology System] machines and to improve software supply. The generation of finances began after 1 January 1978, when it became necessary to pay into the fund a uniform 4 percent for computers of socialist manufacture and the associated expansions (memories, peripherals and remote data processing devices). The fund developed from this, and from the receipts from software trade. Because this provision, tied to a time limit, meant a disadvantage for purchasers of machines after its introduction, they could buy program packages acquired from the fund for less than half price.

But the program is not free. One has to pay to use it, not only because this covers the costs of acquisition but also because the adaptation-developmental work needed for domestic applications also costs money.

By creating the fund, it was intended, primarily, to provide programs for ESZR and MSZR [Minicomputer Technology System] computers, and to advance the considerable financial cover needed to acquire and process systems aiding the development of software. These goals are in harmony with the central computer technology development program also. From the viewpoint of the national economy the task is a three-dimensional one: conversion from traditional data organization to a data base management system, creating possibilities for remote data processing, and aiding the ever growing use of minicomputers.

The computer technology institutions trading in software purchased or developed through the fund also became the owners of the system. The evocative word expresses the essence--the owner undertakes preparations to acquire the program package, carries out its adaptation, and offers various services (installation, maintenance and followup) to those using the programs.

Beginning in January of this year the owner institutions are selected by a competition system, with competitive bids. When judging the applicants, one takes into consideration their computer technology "past" and the level and price at which they undertake to introduce and distribute the program, and when they will pay back into the fund the money made available, together with the interest.

For example, there were three applicants for the owner-institution competition for the SERIES-IV data preparation system. The experts advised that the Computer Technology and Organization Center of the Hungarian Communications Technology Association would be the best owner of the program, because it offered complex services to users at a relatively low price, would begin trading 3 months after takeover, and would repay the costs to the fund in 2 years.

Seventeen Programs

The SZAMALK [Computer Technology Applications Enterprise], which came into being at the beginning of 1982 with the uniting of a number of firms and institutions, became the system owner for a remote data processing software package, also on the basis of a competition. The system has been traded in our homeland since December 1980 and it has more than 30 users, including universities and large enterprises. This general purpose data base management system of American manufacture leads into the future--it manages the data centrally, as members of a single independent file. It can be used well where a number of users need the information at one time, for example, in the production-guidance and product-development work of large enterprises with a number of sites.

Analyzing the experiences of the institutions competing for the office of system owner, it can now be established that program adaptation at one site was a good idea from economic-professional considerations. The owner saves the individual users from the work and costs of adaptation, installation and maintenance. It is a significant foreign-exchange saving that the owner institutions can repay part of the price of the programs with intellectual work.

As for the fund, thus far 17 programs have been purchased and the results justify the existence of a central financial cover. Central acquisition of program packages needed by a number of users is substantially cheaper than if they had been purchased individually by enterprises using computer technology. And since software acquisition and development takes place according to uniform technical viewpoints it helps to develop uniform program systems for ESZR machines, and thus additional costs can be saved.

Eliminated With Time

Uniformization is especially important in the case of programs which operate computers, in the case of so-called basic software, because the applications programs serving to solve concrete tasks are built on these.

The ahcievements of the past period and the current acquisitions and developments will make it possible in the near future to buy programs simultaneously serving the interests of many users from the sales of earlier systems. Thus the fund will become self-sustaining. Thus it can be foreseen that after 1983 the 4 percent surcharge may be eliminated.

8984
CSO: 2502/88

END

END OF
FICHE
DATE FILMED

Sept. 29, 1982